

INTERIM DRAFT PUBLIC COMMENT

COMBINED ALTERNATIVES
ANALYSIS REPORT
NORTHSIDE SANITARY LANDFILL AND
ENVIRONMENTAL CONSERVATION
AND CHEMICAL CORPORATION

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EXECUTIVE SUMMARY

INTRODUCTION

This Combined Alternative Analysis (CAA) report discusses the study methods used in developing and evaluating remedial action alternatives for the Environmental Conservation and Chemical Corporation (ECC) site and the Northside Sanitary The alternatives developed in this Landfill (NSL) site. report are derived from the alternatives developed for the individual sites and discussed in the ECC and NSL Feasibility Study (FS) reports. The purpose of combined alternatives for the adjacent sites is to ensure the remedial actions are compatible with each other, to avoid duplicate remedial actions, and to integrate remedial actions to achieve cost savings. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 104(d)(4) states that sites geographically close or posing similar threats to the public health, welfare, and the environment may be treated as one site.

The U.S. Environmental Protection Agency (EPA) uses this report to recommend a cost-effective remedial action alternative for the sites in accordance with the National Oil and Hazardous Substances Contingency Plan (NCP) (February 18, 1986). Section 300.68(i) of the NCP states the appropriate extent of remedy is defined as a "cost effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment."

The CAA report is based on information contained in the following reports:

- o Final ECC Remedial Investigation (RI) Report, March 14, 1986
- o Final NSL RI Report, March 27, 1986
- o Public Comment ECC FS Report November 7, 1986
- o Public Comment NSL FS Report November 7, 1986

SITE BACKGROUND

The ECC and NSL sites are next to each other in a rural area of Boone County, Indiana, near the intersection of State Route 32 and U.S. Highway 421 and about 10 miles northwest of Indianapolis. The ECC site occupies 6.5 acres immediately west of the 168-acre NSL site, of which approximately 70 acres is landfilled.

NSL is a privately owned and operated active solid waste disposal facility. The site has been active since at least 1962 and has accepted various industrial and municipal

wastes during the course of its operation. The vice president of NSL has estimated 16 million gallons of hazardous wastes have been disposed of in the landfill. A 3-acre oil separation lagoon on the landfill surface is evident in a 1977 aerial photograph. The site has had recurring operational deficiencies as reported by the Indiana State Board of Health (ISBH). The EPA detected leachate running into Finley Creek, and groundwater contamination was detected in monitoring wells at the site. The site was placed on the National Priorities List in 1983.

ECC began operations in 1977 and was engaged in the recovery/reclamation/brokering of primary solvents, oils, and other wastes received from industrial clients. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Reclamation processes included distillation, evaporation, and fractionation to reclaim solvents and oil.

Several memorandums from ISBH discuss the disposal of ECC wastes in the NSL landfill. ECC wastes reportedly disposed of at NSL were 5,000 gallons/month of wastewater from the ECC oil reclamation process, still bottoms and solvent recovery waste, 50 to 80 drums/day of paint ludge, thinner, stain and resin sludge, and at least 7,000 drums of unreported contents.

Drum shipments to ECC were halted in February 1982 after EPA and ISBH investigations showed accumulation of contaminated stormwater onsite, inadequate management of drum inventory, and several spill incidents. In 1983 ECC was placed on the National Priorities List (NPL) of hazardous waste sites. EPA subsequently conducted removal actions at ECC including removal, treatment, and disposal of cooling pond waters, about 30,000 drums of waste, 220,000 gallons of hazardous waste from tanks, and 5,650 cubic yards of contaminated soil and cooling pond sludge.

SITE DESCRIPTION

The area surrounding the sites is largely undeveloped. Land use to the east and south of the site is agricultural, to the west and north it is residential. Approximately 50 residences are within 1 mile of the site.

An unnamed drainage ditch that separates NSL from the ECC site flows into Finley Creek near the southwest corner of the landfill. Finley Creek discharges into Eagle Creek about one-half mile downstream of the site. Eagle Creek then flows south for about 9 miles before emptying into the Eagle Creek Reservoir, which is used by the City of Indianapolis for a portion of its drinking water supply.

RESULTS OF REMEDIAL INVESTIGATIONS

Remedial investigations including soil, hydrogeologic, surface water, and sediment investigations of the sites began in 1983 and continued to November 1985. Details of the investigations are included in the ECC and NSL Remedial Investigation Reports.

ECC SITE

Soil contaminants found onsite were primarily volatile organic compounds (VOC's) and phthalates. Migration of VOC's in the soil to the shallow saturated silty clay zone has occurred onsite. The shallow sand and gravel deposit (approximately 18 feet below ground surface) has also been found to be contaminated with VOC's though the source may have been a former cooling pond onsite rather than downward migration from the shallow saturated zone. Organic contaminants were also found in Finley Creek immediately downstream of the site.

Under existing site conditions, the VOC's and certain phthalates will tend to leach from subsurface soil into the groundwater and slowly migrate to the unnamed ditch or Finley Creek downgradient of the site. Once in the surface waters, contaminants will either volatilize, adsorb to sediment, or experience dilutions on the order of 20 to 1 before reaching the downstream Eagle Creek Reservoir.

NSL SITE

Soil contaminants found in peripheral subsurface soils were primarily organic and inorganic compounds. The sand and gravel lens near the surface in the southwest corner of the site (the lens constitutes the shallow sand and gravel deposit beneath the ECC site) has also been found to be contaminated with VOC's. Organic contaminants were also found in Finley Creek immediately downstream of the site.

Specific contaminant types and quantities disposed of at the NSL site are largely unknown. Data are also unavailable to locate the burial areas within the 70-acre landfill with the exception of the oil separation lagoon.

Since contamination within the landfill cannot be quantified, it is not possible to estimate future releases of contaminants nor the resulting effects on the surrounding environment. Over time, contaminants at the site perimeter would be expected to increase to a maximum level and then decrease to background concentrations. It is possible that if contaminant types or levels increase, the time period before which concentrations permanently decrease to nonhazardous levels may be 100 years or longer.

ENDANGERMENT ASSESSMENT RESULTS

The endangerment assessment found that under the no action alternative potential unacceptable risks to human health and the environment exist at the ECC and NSL sites. These risks are summarized in Table 1.

The exposure pathway potentially affecting the largest number of people is release of contaminants to Finley Creek from groundwater or landfill leachate and their subsequent transport to Eagle Creek Reservoir. Current contaminant concentrations measured in groundwater and in Finley Creek do not result in levels posing a threat to human health when they reach the drinking water intake of the reservoir. This is based on the evaluation of contaminant concentrations assuming dilution only. Further reductions in concentrations would be expected from volatilization, adsorption, and degradation. Contaminant concentrations in groundwater and in Finley Creek, however, could increase in the future either as a result of contaminant migration from source areas or as a result of new contaminants created in degradation processes. possible that threats to human health could occur in the future for the population served by the Eagle Creek Reservoir.

ASSEMBLY OF REMEDIAL ACTION ALTERNATIVES

Remedial action goals were developed to address the site problems identified in the endangerment assessment.

With these goals in mind, CAA alternatives were developed by combining the components of ECC and NSL alternatives presented in their respective FS reports. The major components and objectives of the alternatives are described below.

ALTERNATIVE 1--NO ACTION

The no action alternative provides a baseline for comparison of other alternatives. Since remedial actions would not be taken at the site, the public health and environmental risks would be identical to those described in the endangerment assessment.

ALTERNATIVE 2--ACCESS RESTRICTIONS WITH SOIL COVER AND LEACHATE COLLECTION AND TREATMENT

Alternative 2 includes deed restrictions, fencing, a soil cover over the landfill to promote revegetation, a soil cover over the ECC site, disposal of sediment on NSL, rerouting the surface waters, collection and treatment of the leachate seeps (estimated flowrate of 40 gpm), and monitoring of the leachate, groundwater, and surface water. The intent was to

Table 1 (Page 1 of 2) SUMMARY OF EXPOSURE PATHWAYS AND ASSOCIATED RISKS

Operable Unit	Exposure Pathways	Associated Risks	
Soil and Landfill Contents			
Surface Soil	Direct contact, inhalation, and ingestion of surface contaminants. Transport of contaminants offsite as dust and runoff.	Based on a limited number of samples of NSL, the landfill surface does not appear to be contaminated. Soil cover material at ECC was not found to be contaminated before placement onsite. Contaminated ponded water on the cover indicates cover may contain contaminants. Potential exists for adverse health effects though data do not exist to quantify risk.	
Landfill Contents and Subsurface Soil	Future development onsite or erosion of the landfill surface could result in direct contact, inhalation, and ingestion of contaminants.	If development or erosion occur, potential for adverse health effects from exposure exists. Excess lifetime cancer risks for ingestion at ECC range from 4 x 10 to 8 x	
Leachate Sediment and Sediment in Old Creek Beds of Finley Creek	Direct contact, inhalation, and ingestion of contaminants. Transport of contaminants as dust and runoff.	Potential exists for adverse health effects resulting from long term exposure to contaminants. This is based on one leachate sediment sample which contained lead and chlordane and one creek bed sediment sample which contained PCB's.	
Leachate			
Leachate Seeps	Direct contact, inhalation, and ingestion of contami- nants. Discharge of contami- nants to surface waters.	Current risk to public health and environment is negligible since long term ingestion and use of the leachate liquid is highly unlikely. However, leachate seeps represent the potential for future release of contaminants that could result in adverse health effects for humans and adverse effects on the aquatic ecosystem in the surface waters.	
Leachate Liquid in Collection System	Direct contact, inhalation, and ingestion of contaminants.	Current unacceptable risk to public health and environment is minimal since long term exposure is highly unlikely. Potential exists for contamination to increase from future releases.	
Landfill Liquid	Future development onsite could result in direct contact, inhalation, and ingestion of contaminants.	Potential exists for adverse health effects; however, development in the proximity of the landfill is highly unlikely.	
Groundwater	Installation of a potable well within the zones of contamination could result in direct contact, inhalation, and ingestion of contaminants.	Potential for adverse health effects from long-term exposure. Several Maximum Contaminant Limits (MCL's) are exceeded. Excess lifetime cancer risk can be as high as 4x10.	

Operable Unit	Exposure Pathways	Associated Risks	
Groundwater (Cont.)	Discharge of contaminants to surface waters.	Potential for adverse health effects from ingestion of fish bioconcentrating contaminants at projected surface water concentrations from ECC ₆ Excess_lifetime cancer risk of 1x10 to 3x10 . Projected concentrations exceed WQC for protection of human health from ingestion of aquatic organisms.	
		Concentrations of contaminants in groundwater do not currently suggest a threat to aquatic life as measured by ambient water quality criteria and LC ₅₀ values.	
		However, potential for increasing contaminant types or levels in groundwater and surface water could result in adverse effects on public health and aquatic life.	
	Possible migration of contaminants offsite.	Groundwater is believed to discharge to Finley Creek. In this case, risk from offsite migration is negligible. If additional investigations indicate that groundwater is flowing under Finley Creek and to the south, the risk would be reevaluated.	
	Possible migration of contaminants to a deep aquifer.	Groundwater gradients are upward and this pathway is not possible.	
Surface Water and Sediment	Contact or assimilation of contaminants by aquatic life.	Concentrations of contaminants in the surface waters and sediment do not currently suggest a threat to aquatic life as measured by ambient water quality criteria and ${\rm IC}_{50}$ values.	
		However, potential for increasing contaminant types or levels in groundwater and surface water could result in adverse effects on public health and aquatic life.	
	Direct contact, inhalation, and ingestion of contami-nants.	Concentrations of contaminants in the surface waters and sediment do not currently suggest a threat to human health. Ingestion and use of water in Finley Creek and the unnamed ditch are highly unlikely. Increases in contaminant types or levels in future could result in adverse health effects.	
	Transport of contaminants downstream to Eagle Creek and Eagle Creek Reservoir, a water supply source.	Concentrations of contaminants in the surface waters and sediment do not currently suggest a threat to human health. Future release of contaminants to the surface waters may change the concentrations and risk to public health could occur. Degradation products such as vinyl chloride may increase in the future and could become a threat to public health.	

present a low-cost alternative that offers the lowest level of protection to public health and the environment. If contaminant concentrations in the proposed monitoring wells exceed applicable and relevant and appropriate requirements (ARAR's), future remedial actions would be initiated.

ALTERNATIVE 3--ACCESS RESTRICTIONS WITH RCRA CAP AND LEACHATE COLLECTION AND TREATMENT

Alternative 3 is identical to Alternative 2 with the exception of a RCRA cap over both sites in place of a soil cover. This alternative is intended to provide a greater level of public health protection by reducing contaminant migration to the groundwater through reduction in surface water infiltration while also meeting technical requirements of landfill capping for site closure under RCRA. Monitoring would still be necessary to detect migration of contaminants in the groundwater. The quantity of leachate migrating to the groundwater will be reduced significantly; however, the potential for future contamination of the groundwater remains. As with Alternative 2, if contaminant concentrations in the proposed monitoring wells exceed ARAR's, future remedial actions would be initiated.

ALTERNATIVE 4--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT

Alternative 4 is essentially identical to Alternative 2 with the addition of groundwater interception to prevent the migration of groundwater contaminants offsite or to the surface waters. This alternative addresses the groundwater and surface water operable unit goals of providing adequate protection of public health and the environment from future contamination of the surface water. Leachate from NSL would continue to migrate to the groundwater so collection and treatment would be required indefinitely at NSL. At ECC, soil contaminants which leach to groundwater would be removed and treated, though treatment of the combined flow of 140 gpm would also likely be required indefinitely (possibly for 100 years or more).

ALTERNATIVE 5--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GRCUNDWATER INTERCEPTION, AND TREATMENT

Alternative 5 includes leachate and groundwater interception and treatment similar to Alternative 4 but with a RCRA cap over the sites. The objective of the cap is to minimize further leaching of contaminants in the soil or landfill contents to the groundwater. This may eventually allow termination of the groundwater collection and treatment system though leachate collection and treatment would continue to be necessary. Treatment of an estimated 100 gpm would be necessary initially and would decline to 65 gpm after about 5 years.

ALTERNATIVE 6--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION, AND TREATMENT

Alternative 6 employs a groundwater collection system intended to lower the water table beneath the contaminated or potentially contaminated zones at both sites, thus isolating the contaminants from the groundwater. Combined with a RCRA cap the alternative is intended to eventually prevent further contamination of the groundwater and result in groundwater treatment of leachate only. The initial flow requiring treatment is estimated at 340 gpm, declining to 210 gpm after 5 years and finally to 6 gpm within 15 years. The collection system, however, would be operated indefinitely to maintain the lower water table. This alternative is intended to provide a greater level of protection to the public health and environment by reducing contaminant migration.

ALTERNATIVE 7--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION, AND TREATMENT, AND ECC SOIL VAPOR EXTRACTION

Alternative 7 incorporates all the components and objectives of Alternative 6 with the additional treatment of ECC-contaminated soil. Soil vapor extraction would be used to reduce VOC's in the unsaturated zone to below 10⁻⁰ cancer risk levels. The public health risk from direct contact with ECC-contaminated soil in the event of site development would be greatly reduced. It is not expected that this would reduce the groundwater treatment period.

ALTERNATIVE 8--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL INCINERATION

Alternative 8 incorporates the objectives of Alternative 7. However, ECC soil contaminated with organics is treated via onsite incineration. All soil with organic contaminant levels above 10 cancer risk levels or acceptable daily intake levels would be incinerated. This results in permanent destruction of organic contaminants.

ALTERNATIVE 9--ACCESS RESTRICTIONS WITH ONSITE RCRA LANDFILL

Alternative 9 includes deed restrictions; excavation of the landfill contents, peripheral soils, sediments, and ECC-contaminated soil; and disposal of the waste materials in an onsite RCRA-type landfill. This alternative addresses all the operable unit goals and provides the highest level of protection of all the alternatives.

DETAILED ANALYSIS OF ALTERNATIVES

Each alternative is evaluated using technical, public health and welfare, environmental, institutional, and cost criteria. The detailed cost analysis for each alternative includes estimates of operation and maintenance (O&M) costs, capital costs, replacement costs, and development of present worth.

The results of the detailed analysis are summarized in Table 2.

COMPARISON OF ALTERNATIVES

ALTERNATIVE 1--NO ACTION

The No Action Alternative does not mitigate or minimize the existing threats to public health and environment identified in the endangerment assessments for the sites and summarized in Chapter 1 of this report. Potential adverse effects exist for exposure to contaminants in soils, landfill contents, sediment, leachate, groundwater, and surface waters. Since remedial actions are required to mitigate or minimize these existing or potential exposures, the No Action Alternative is not recommended by U.S. EPA.

ALTERNATIVE 2--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION AND TREATMENT

The total present worth of Alternative 2 is \$18,100,000. It is considered by EPA to be effective in mitigating and minimizing threats to public health and the environment from exposure to contaminated soils, landfill contents, sediment and leachate.

The remedial actions do not address leaching of contaminants to the groundwater or migration of contaminated groundwater to surface water. This alternative relies on monitoring to detect increases in contaminant levels or types in groundwater and surface water. Because groundwater monitoring locations of necessity are located very near surface water discharge areas, there may not be sufficient time for implementation of remedial actions before adverse effects occur if previously undetected contaminants or increased levels of contaminants are detected. Since the potential for increasing contaminant levels or types is great because of the heavily contaminated ECC soils and the reported large quantities of hazardous waste disposed of at NSL, monitoring alone is not considered a reliable means of protecting the public health and environment. Therefore, Alternative 2 is not recommended by EPA.

EVALUATION CRITERIA

Technical

ALTERNATIVE 6 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected and treated.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Estimated time of design and construction is 1 to 2 years.

Short-term adverse construction

effects on aquatic habitat likely

mitigated by stream rehabilitation

Noise and dust generated by truck

Aquatic habitat improves over time

because of cessation of contaminant

traffic during RCRA cap

discharge to Finely Creek.

construction.

due to stream relocation will be

ALTERNATIVE 7

Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Longterm reliability of deed restriction implementation is unknown

Public health risk from future site excavation and direct contact, inhalation, and ingestion of VOC's in ECC contaminated soil is reduced to below 10 cancer risk levels. Potential ADI exceedance for lead and cadmium is unchanged but mitigated by access restrictions and cap.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected and treated.

ECC soil vapor extraction greatly reduces generation of contaminated leachate.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future. additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Installation of cap over ECC would follow the 2 to 4 year operation period of soil vapor extraction. Total estimated time of design and construction is 3 to 6 years.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

Aquatic habitat improves over time because of cessation of contamination discharge to Finley Creek.

Noise and dust generated by truck traffic during RCRA cap construction.

Short-term adverse construction effects on aquatic habitat likely due

Aquatic habitat improves over time because of cessation of contaminant discharge to Finley Creek.

mitigated by stream rehabilitation.

to stream relocation will be

Noise and dust generated by truck traffic during RCRA cap construction.

surface water during ECC soil

excavation could occur.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

Aquatic habitat improves over time because of cessation of contaminant discharge to Finely Creek.

Releases of contaminants to the air or surface water during landfill excavation could occur.

equipment operation onsite during RCRA

Institutional

Public Health

and Environment

All standards will be met. CERCIA goal of protection of public health. welfare, and environment is achieved.

All standards will be met. CERCLA goal of protection of public health. welfare, and environment is achieved.

All standards will be met. CERCLA goals will be met. Requires delisting of residue to dispose of it onsite. No permits required but need to follow technical requirements.

All standards will be met. CERCLA goal of protection of public health. welfare, and environment is achieved.

COST

Capital Annual Average Operation and Maintenance \$27,600,000

896.000

\$66,400,000

76,100,000

\$105,000,000

108,000,000

ALTERNATIVE 8 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

ALTERNATIVE 9

Access Restrictions With Onsite

RCRA Landfill

Effective in protecting public health

from direct contact with contaminants

given proper implementation of deed

restrictions and maintenance of RCRA

cap for an indefinite period. Long-

term reliability of deed restriction

Effective in protecting public health

from direct contact with contaminants

discharge. If properly constructed,

Effective in eliminating direct con-

sumption of groundwater given proper

implementation of deed restrictions

Effective in preventing migration of

contaminated groundwater to surface

though is believed to be good given

Monitoring is essential to check the

Potential for exposure of construction

workers during excavation is very

integrity of the landfill liner.

Estimated time of design and

construction is 3 to 5 years.

Long-term reliability of RCRA landfills has not been demonstrated

prohibiting installation of wells

the onsite RCRA landfill would prevent

by eliminating surface leachate

implementation is unknown.

leachate discharges.

onsite.

water or offsite.

proper maintenance.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Longterm reliability of deed restriction implementation is unknown

Public health risk from future site excavation and direct contact, inhalation, and ingestion of organic contaminants in soil reduced to below cancer risk levels. Potential ADI exceedance for lead and cadmium is unchanged but mitigated by access restrictions and cap.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected

ECC soil incineration greatly reduces generation of contaminated leachate.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Installation of cap over ECC would follow the 3 to 4 years implementation period of ECC soil incineration. Total estimated time of design and construction is 4 to 6 years.

Short-term generation of noise and dust from truck traffic and heavy landfill construction.

Total Present Worth

849.000 37,300,000

39,300,000

\$28,500,000

849,000

275,000

TABLE 2 (Page 2 of 2) **SUMMARY OF DETAILED EVALUATION OF ALTERNATIVES ECC-NSL CAA**

EV.	ALU.	ATI	<u>ON</u>
CR	TER	IIA.	

ITENIA

Technical

Potential exists for adverse health effects resulting from exposure to subsurface soil, landfill contents, and leachate sediments and sediments in the old creek beds of Finley Creek. Soil cover at ECC may pose low level public health risk.

No Action

ALTERNATIVE 1

Potential exists for adverse effects to public health and environment from future releases of contaminants in leachate.

Potential exists for adverse health effects from consumption of contaminated groundwater or fish that have bioconcentrated contaminants. Potential exists for adverse effects on public health and environment from future releases of contaminants to surface water.

ALTERNATIVE 2

Access Restrictions With Soil Cover, Leachate Collection and Treatment

Effective in protecting public health from direct contact with soil contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leachate discharge. Leachate collection and soil cover eliminates leachate discharges to surface water. Leachate can still migrate to groundwater.

Migration of contaminated groundwater to surface water is not eliminated. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement remedial action may not be available before public health or environment are affected.

Monitoring frequency and comprehensiveness are critical to successful implementation.

Estimated time of design and construction is 6 months to 1 year.

ALTERNATIVE 3

Access Restrictions With RCRA Cap, Leachate Collection and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period, long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface water. Leachate can atill migrate to groundwater, but quantity is reduced by an estimated 90 percent.

Migration of contaminated groundwater to surface water is not eliminated, although would be reduced relative to Alternative 2. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement mitigative action may not be available before health or environment are affected.

Monitoring frequency and comprehensiveness are critical to successful implementation.

Estimated time of design and construction is 1 to 2 years.

ALTERNATIVE 4

Access Restrictions With Soil Cover, Leachate Collection, Groundwater Interception and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leachate discharge. Leachate and groundwater collection and soil cover eliminates discharges to surface water. Leachate can still migrate to groundwater which is subsequently collected and treated.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater interception and treatment system.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional storage volume should be considered.

Estimated time of design and construction is 1 year.

ALTERNATIVE 5 Access Restrictions With RCRA Cap,

Leachate Collection, Groundwater
Interception and Treatment

Effective in protecting public
health from direct contact with
contaminants given proper implemen-

tation of deed restrictions and

maintenance of RCRA cap for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface

water. Leachate can still migrate

reduced by an estimated 90 percent.

to groundwater, but quantity is

Groundwater is subsequently

collected and treated.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater interception and treatment system.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Estimated time of design and construction is 1 year.

Public Health and Environment

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

Minor dust releases and noise generation during site work.

Show y due effectigated to

.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation

Noise and dust generated by truck traffic during RCRA cap construction.

effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation

Minor dust releases and noise genera-

Short-term adverse construction

tion during site work.

Aquatic habitat improves over time because of cessation of contaminant discharge to Finley Creek. mitigated by stream rehabilitation.

Noise and dust generated by truck traffic during RCRA cap construc-

Short-term adverse construction effects on aquatic habitat likely

due to stream relocation will be

Aquatic habitat improves over time because of cessation of contaminant

Institutional

Uncontrolled hazardous waste site does not meet goals of CERCLA.

Groundwater in violation of drinking water quality criteria, Surface water exceeds ambient water quality criteria for protection of human backley.

violated. May need to acquire land and implement deed restrictions. The potential for releases of contaminated groundwater from the site continues, so policy of CERCLA may not be met.

Water quality criteria may be

Water quality criteria may be violated. May need to acquire land and implement deed restrictions. The potential for releases of contaminated groundwater from the site continues, so policy of CERCLA may not be met.

The CERCLA goal of protection of public health, welfare, and environment is achieved.

All standards will be met. CERCLA goal of protection of public health, welfare, and environment is achieved.

discharge to Finley Creek.

COST

Capital
Annual Average
Operation and Maintenance
Total Present Worth

s

\$ 8,710,000

\$21,400,000

\$11,200,000

\$24,900,000

832,000

-0-

-0-

941,000

000

819,000 29,900,000 982,000 20,800,000

33,900,000

ALTERNATIVE 3--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION AND TREATMENT

The present worth of Alternative 3 is \$29,900,000. The cap would reduce leaching of contaminants to the groundwater by an estimated 90 percent and as a result it would reduce the potential for contaminant levels to increase in the future. Migration of groundwater contaminants to surface water, however, would not be mitigated and, as with Alternative 2, protection of public health and environment would be dependent on groundwater and surface water monitoring. As discussed earlier, monitoring alone is not considered reliable. Alternative 3 is not considered to provide adequate protection of public health and the environment and is not recommended by EPA.

ALTERNATIVE 4--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION AND TREATMENT

The present worth cost of Alternative 4 is \$20,800,000. This alternative is considered effective in protecting public health and the environment from site contamination. The groundwater and leachate collection and treatment systems, however, would be required to operate for a long period of time, possibly in excess of 100 years, because contaminants could continue to leach from soils and landfill contents. Though groundwater collection and treatment has been shown to be reliable, continued maintenance and operation far into the future cannot be assured.

ALTERNATIVE 5--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION AND TREATMENT

The present worth of Alternative 5 is \$33,900,000. The cap would reduce leaching of contaminants from the unsaturated zone to the groundwater by an estimated 90 percent and, as a result, could reduce the potential for contaminant levels to increase in the future. It is possible that the cap may also reduce the operational period for the groundwater collection and treatment system, though the actual period of operation cannot be reliably estimated.

ALTERNATIVE 6--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT

The total present worth of Alternative 6 is \$37,300,000. The groundwater isolation system employed in Alternative 6 lowers the groundwater table below the zone believed to be

currently contaminated. The intent is to isolate contaminants in the unsaturated zone so they cannot migrate in groundwater. Eventually the groundwater would no longer be contaminated and treatment would not be necessary. This may occur when the water table is fully lowered, estimated to be 5 years. It is possible, however, that contaminants released from buried drums or immiscible fluids could migrate to the lower water table. As a result, the reliability of the groundwater isolation system to reduce the operational period of groundwater treatment is not assured. In addition, the groundwater collection system would have to be operated indefinitely to maintain the lower water table. As with Alternatives 4 and 5, the reliability of long-term maintenance and operation of the collection system is unknown.

The isolation system of Alternative 6 does provide substantially more time between a potential collection system failure and a release of contaminants to surface water. This occurs because of time necessary for the water table to rise onsite and groundwater gradients reverse. Since the time available under Alternatives 4 and 5 is considered substantial, this is not considered a significant benefit.

ALTERNATIVE 7--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL VAPOR EXTRACTION

The present worth of Alternative 7 is \$39,300,000. major public health and environmental benefit of soil vapor extraction is the removal of the relatively mobile volatile organic compounds (VOC's) from the soil. This results in a reduced potential for human exposure or overland migration of VOC contaminants offsite in the event of site development. The probability of site development, in violation of deed restrictions, at some point in the future is not known but is believed to be minimal because of the presence of the immediately adjacent NSL site. If site development were to occur, health threats from exposure to other organic and inorganic contaminants would still be present. Removal of VOC's from the unsaturated zone would have little effect on the operational period of the groundwater collection system since these contaminants would be nearly immobilized by the construction of a RCRA cap over the ECC site.

Because a public health threat would remain in the event of future ECC site development and because removal of VOC's from the unsaturated zone is not expected to affect ground-water collection and treatment, the advantages of soil vapor extraction are not considered great. The expenditure of \$2,000,000 in present worth for ECC soil vapor extraction for the marginal reduction in health threat is not considered cost effective. Alternative 7 is not recommended by EPA.

ALTERNATIVE 8--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL INCINERATION

The present worth of Alternative 8 is \$76,100,000. ECC soil incineration would result in the destruction of all organic contaminants in soil in the unsaturated zone with contaminants above the 10⁻⁶ cancer risk level. The resulting reduction in health threats in the event of future site development would be greater than in Alternative 7. The presence of NSL adjacent to ECC and the restrictions on the deed preventing site development make this unlikely. The present worth of \$38,800,000 for ECC soil incineration for reducing public health threats in the unlikely event of future site development is not considered cost effective. Alternative 8 is not recommended by EPA.

ALTERNATIVE 9--ACCESS RESTRICTIONS WITH ONSITE RCRA LANDFILL

The present worth of Alternative 9 is \$108,000,000. The new landfill would include a double liner, leachate collection system, leachate and groundwater monitoring system, gas collection system, and multimedia cap.

The new landfill would effectively isolate the contaminants from the environment. Operation and maintenance of the facility would be required indefinitely. Though long-term reliability of the facility is believed to be good, proper operation and maintenance far into the future cannot be assured. Exposure of workers to the hazardous materials may occur during excavation of ECC soils and the landfill. Also inadvertent releases to the environment by volatilization or surface erosion during the several years of construction activity would likely occur. The expenditure of \$108,000,000 in present worth is not considered cost effective by EPA when the hazards induced by site excavation are considered and the availability of a lower cost alternative with a similar level of protection for the public health and environment.

COMPARISON OF ALTERNATIVES 4, 5 AND 6

Alternatives 4, 5 and 6 were all found to provide adequate protection of public health, welfare, and environment, if they are operated and maintained through the period of continued contaminant release. Since this period may be in excess of 100 years, an important consideration in alternative selection is to minimize the operation and maintenance necessary, particularly in regards to collection and treatment of contaminated leachate and groundwater. Generally, the less operation and maintenance required the more reliable the system will be in the future.

Alternative 4 requires the greatest amount of treatment for leachate and groundwater since it does not include a RCRA cap. An estimated 40 gpm of leachate and 100 gpm of groundwater may require treatment in excess of 100 years. In comparison to Alternatives 5 and 6, which include a RCRA cap, Alternative 4 would have the poorest long-term reliability for continued effective operation.

Alternatives 5 and 6 both reduce leachate generation to an estimated 5 gpm as a result of the RCRA cap. The groundwater isolation system of Alternative 6 could reduce the need for treatment to leachate only. This could occur as early as 5 years. For the reasons noted earlier, however, this is uncertain and treatment of groundwater may be required indefinitely, as is the case for Alternative 5. In addition, Alternative 6 would require operation and maintenance of the collection system indefinitely, irrespective of whether treatment is necessary.

Comparison of the costs of Alternatives 5 and 6 show Alternative 6 with the following higher costs:

- o \$2.7 million more in capital cost because of the groundwater isolation system
- o \$17,000 more in annual operation and maintenance costs (assuming 15 years of groundwater treatment for Alternative 6) as a result of high initial flow rates
- o \$3.4 million more in present worth

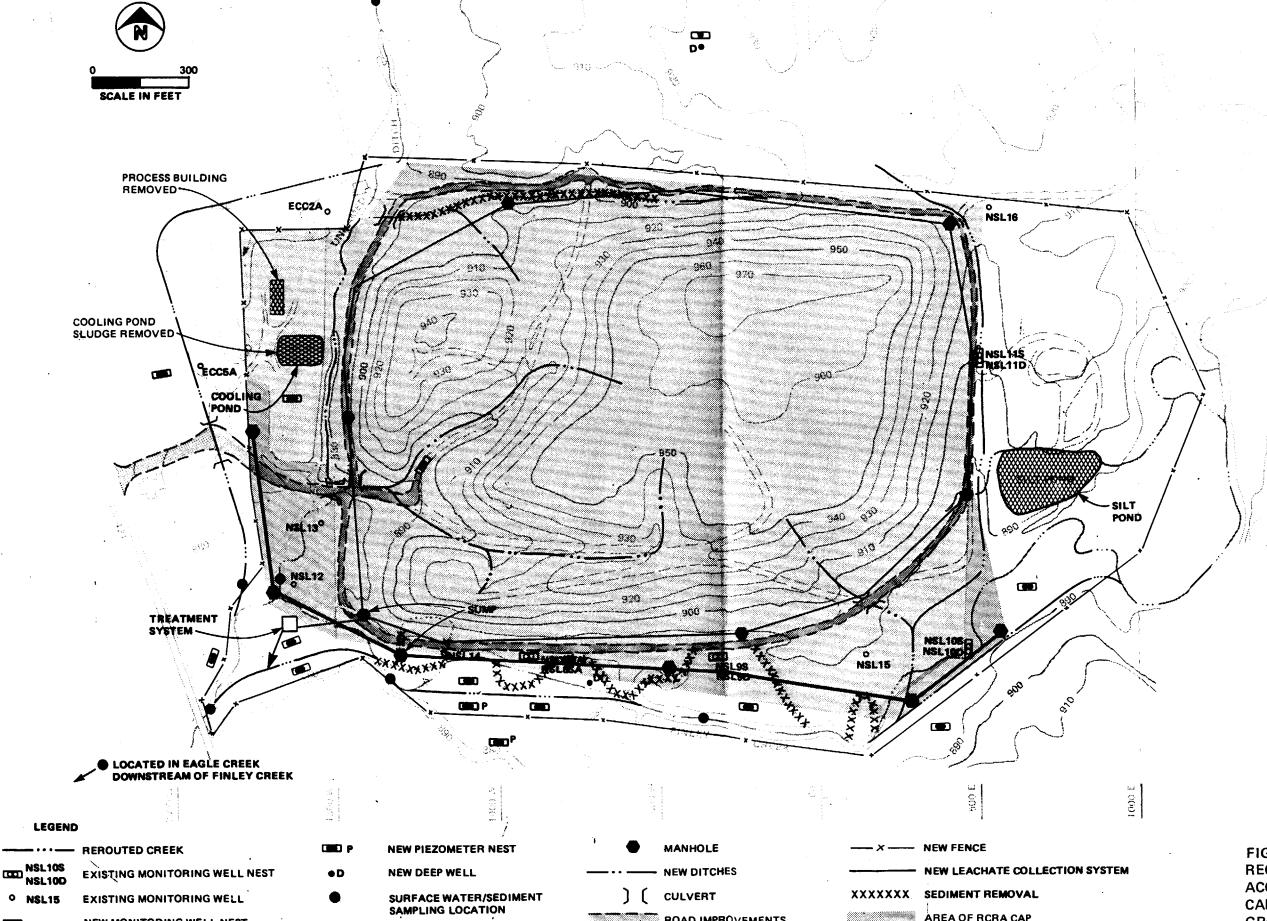
The present worth of Alternative 6 would still be \$1.6 million more than Alternative 5 if treatment of groundwater could be terminated after 1 year. Groundwater treatment beyond 15 years would result in even greater cost differences between Alternatives 5 and 6. Because of the greater costs of Alternative 6 and the uncertainty regarding the period of groundwater treatment, it is not recommended by EPA.

RECOMMENDED ALTERNATIVE

U.S. EPA's recommended alternative is Alternative 5. The major components of the alternative are:

- o Access restrictions
- Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater interception
- o Treatment

A site plan of Alternative 5 is shown in Figure 1.



TENTE ROAD IMPROVEMENTS

EXTRACTION WELL

GROUNDWATER INTERCEPTION

SYSTEM (CONSISTS OF FRENCH

DRAINS

NEW MONITORING WELL NEST

AREA OF RCRA CAP

FIGURE 1 RECOMMENDED ALTERNATIVE ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT ECC-NSL CAA

ACCESS RESTRICTIONS

Deed restrictions would be placed on the landfill property and the ECC site. The restrictions should prevent future development of the land to protect against direct contact with contaminants or further migration that could result from site excavation and development. The deed restrictions should also prohibit use of groundwater or installation of wells onsite. Access to the site would be controlled by completing the fencing around the site perimeter and posting signs.

COOLING POND SLUDGE REMOVAL

Contaminated sludge or soil remaining in the former ECC cooling pond would be excavated and disposed of at a licensed RCRA landfill. Soil samples would be collected from soil borings in the former cooling pond and analyzed to determine excavation locations and volumes. Excavated sludge or soil would be replaced with clean fill. Removal of the remaining contaminated sludge would reduce contamination of the sand and gravel deposit beneath ECC. Groundwater removed during sludge excavation would be transported and treated at a licensed RCRA facility or treated onsite in the groundwater treatment system.

RCRA CAP AND SURFACE CONTROLS

These actions include removal of contaminated sediment, rerouting of creeks, and construction of a multimedia cap over ECC and NSL.

Contaminated leachate sediment and sediment in the ditch north of NSL and the old creek beds of Finley Creek would be excavated, dewatered, and disposed of onsite beneath the cap. It was assumed for cost estimating that excavation to a 1-foot depth would be necessary and a total of 4,200 cubic yards would be removed. The actual volume removed would be dependent on further sampling undertaken as part of final design. The creek beds would be backfilled and a soil cover would be placed over areas not under the cap. Contaminated water resulting from the dewatering of the sediment would be treated in the onsite treatment system.

The unnamed ditch would be rerouted to the west of ECC and portions of Finley Creek would be rechannelized. This would route the surface waters farther away from contaminated areas and increase the time available between contaminant detection in groundwater and discharge to Finley Creek or the unnamed ditch.

The RCRA cap would cover both ECC and NSL and include two low permeability layers. From top to bottom, the cap

includes 1 foot of soil for vegetative growth, 1.5 feet of a sand and gravel for drainage, a 30-mil synthetic membrane, 2 feet of clay, and 1 foot of sand (for gas collection on the landfill only). Prior to placing the cap, the site would be graded to eliminate sharp grade changes and to provide for drainage. Also the former process building on the ECC site would be demolished. The concrete floor and foundation would remain and the cap placed on top. The cap would be seeded to control erosion and promote evapotranspiration.

The RCRA cap is expected to reduce the rate of leachate production from 40 gpm to 5 gpm within 5 years. The resulting leachate flowrate requiring treatment would also decrease from 40 gpm to 5 gpm.

MONITORING

Contaminant migration would be assessed through a regular leachate, groundwater, and surface water monitoring program. Leachate would be sampled at the leachate collection sump as part of the leachate collection and treatment system. Groundwater would be monitored during the first year using 15 of the existing wells and an additional 26 new monitoring wells. The 41 monitoring wells would be sampled quarterly the first year and analyzed for the full organic and inorganic priority pollutant list.

Monitoring well sampling would be reduced dependent on results of the four initial sample rounds. It is estimated that subsequent semiannual sampling would be necessary at 14 wells. Samples would be analyzed for VOC's, semivolatiles, and inorganics. Water levels of monitoring wells would be taken at the time of sampling and gradients would be calculated.

Surface water and sediment would be sampled at eight locations semiannually. These samples would be analyzed for VOC's, base/neutrals, pesticides, PCB's, and inorganics. Depending on surface water results, fish may be occasionally collected from Finley and Eagle Creek and their tissues analyzed for bioaccumulation of organic contaminants.

LEACHATE COLLECTION

The leachate collection system would consist of a French drain encircling the landfill. The drain would be about 4 feet deep and about 6,000 feet in length. Perforated pipe laid in the trench would be used to transport leachate to a sump located near the treatment system in the southwest corner of the site. The trench would be backfilled with gravel. A 1-foot layer of gravel would also be placed on the sideslopes of the landfill to provide a drainage path

for leachate seepage. The RCRA cap described previously would extend over the gravel layer and the drainage trench. The existing leachate collection system would be decommissioned and abandoned.

GROUNDWATER INTERCEPTION

The objective of the groundwater collection system is to prevent contaminated groundwater from migrating past the perimeter of ECC and the landfill and discharging to surface waters. The collection system costed and described here for this alternative will meet this objective based on the information available to date. Further site investigations during final design may alter the design of the collection system; however, the objective of the groundwater interception system will be met.

The groundwater collection system costed consists of a French drain installed along the southern and southwestern boundaries of the landfill and ECC. The trench would be about an average depth of 25 feet (see Figures 4-1, 4-2, and The trench would include two collection pipes, one set 5 feet below the existing water table to function as the interception system, and the other set at the bottom of the trench to be used if the isolation system is implemented at a later time. It is anticipated that an approximate 5-foot overall drawdown of the water table at the collection system would be sufficient to prevent groundwater movement past the system. The French drain would include an impermeable barrier on the south wall of the trench to minimize inflow of water from Finley Creek. The barrier consists of an impermeable synthetic membrane and at least 6 inches of compacted clay. It would extend 3 feet into the till below the sand and gravel deposit in the southwest area of the site. barrier would also extend 75 feet beyond the western end of the drain.

The initial combined flowrate from the leachate and ground-water collection systems is estimated to be 100 gpm with 40 gpm from the leachate collection system. Within 5 years, the flow is estimated to decrease to about 65 gpm because of a reduction in leachate generation.

TREATMENT

Treatment of leachate and groundwater will be required to meet effluent discharge limits set in the NPDES permit for discharges to Finley Creek. The limits must protect aquatic life and human health from consumption of aquatic organisms and human health from use of the downstream Eagle Creek Reservoir as a drinking water supply.

The onsite treatment system costed and described here will be capable of meeting the effluent limits. During final design, the treatment system will likely be modified based on pilot and bench-scale testing and more detailed evaluations of capital and operation and maintenance costs. The objective of meeting the discharge limits will be obtained, however.

Leachate and groundwater would be pumped to an onsite treatment plant consisting of precipitation, biological oxidation, and carbon adsorption. The two streams would be combined in a 100,000-gallon holding tank. In the treatment system, the waste stream first passes through the precipitation process for removal of metals and other inorganics. Chromium, copper, iron, lead, and zinc were detected in the groundwater and leachate samples and can be removed by precipitation. Hydroxide precipitation is used for cost estimating purposes. Flocculation and clarification follow the chemical addition and can be accomplished in one basin. Either flocculation with lamella gravity settlers or solids contact clarifiers could be used. Sludge is removed from the bottom of the basin and can be thickened, dewatered with a filter press, and disposed of in a RCRA landfill.

Effluent from the precipitation process then goes through powdered activated carbon treatment (PACT), which is a patented activated carbon enhanced biological treatment system. The PACT system combines biological treatment and carbon adsorption into one process. The system works through the addition of powdered activated carbon to the influent of the activated sludge process. The system consists of carbon feeding equipment, an aeration basin with the necessary appurtenances, a clarifier, and solids handling equipment. Solids would be wasted to an aerobic digester followed by dewatering. Solids would then be disposed of at a RCRA landfill unless they could be delisted as a nonhazardous waste. Spent carbon in the waste solids could be separated and regenerated offsite.

Granular media filtration would be included in the treatment system following either the precipitation system or the PACT system or both The advantage of having a filter after each unit would be that less metals would carry over into the PACT system and that solids with low settleability would be removed from the biological system effluent. For costing purposes, however, it is assumed that one filter will be used after the PACT system.

OPERATION AND MAINTENANCE REQUIREMENTS

Maintenance would be required for the cap because of erosion, freeze/thaw, and landfill settlement. It was estimated that every fifth year, 10 inches of fill over 50 percent of the

landfill would need replacement. Regular mowing of grass on the cap is required. Routine inspections of the cap surface and the leachate and groundwater collection systems would be required semiannually. Replacement of collection system pumps, cleaning of collection system drains, and refurbishment of monitoring well screens would be undertaken as necessary.

The treatment system would require full-time operators to perform testing and maintenance, to adjust chemical and carbon feed rates, and to ensure that all process units are functioning properly. To provide for regular maintenance or in the event of treatment system failure, a 100,000-gallon holding tank is included. This tank provides a 2-day holding time for untreated leachate.

GLT655/2

Chapter 1 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) and the Indiana Department of Environmental Management (IDEM), formerly the Indiana State Board of Health (ISBH), have determined that the Environmental Conservation and Chemical Corporation (ECC) site and the Northside Sanitary Landfill (NSL) site both near Zionsville, Indiana, pose a threat to the public health, welfare, and the environment. Under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and Execution Order 12316, EPA is given the authority to control the actual or potential release of hazardous substances that pose a substantial threat to the public health, welfare, and the environment.

This Combined Alternative Analysis (CAA) report discusses the study methods used in developing and evaluating remedial action alternatives for the adjacent sites. The alternatives developed in this report are derived from the alternatives developed for the individual sites and discussed in the ECC and NSL FS reports. The purpose of combined alternatives for the adjacent sites is to ensure the remedial actions are compatible with each other, to avoid duplicate remedial actions, and to integrate remedial actions to achieve cost savings. CERCLA Section 104(d)(4) states that sites geographically close or posing similar threats to the public health, welfare, and the environment may be treated as one site.

This report briefly summarizes the Remedial Investigation (RI) results for each of the sites along with the endangerment assessment results (Chapter 1). Chapter 2 presents the remedial action objectives for the combined sites and the assembly of the combined remedial actions. The detailed analysis of alternatives is presented in Chapter 3 followed by the recommended alternative in Chapter 4.

The CAA report is based on information contained in the following reports:

- o Final ECC RI Report, March 14, 1986
- o Final NSL RI Report, March 27, 1986
- o Public Comment ECC FS Report, November 7, 1986
- o Public Comment NSL FS Report, November 7, 1986

SITE BACKGROUND

The ECC and NSL sites are next to each other in a rural area of Boone County, Indiana, near the intersection of State Route 32 and U.S. Highway 421 and about 10 miles northwest of Indianapolis. The ECC site occupies 6.5 acres immediately

west of the 168-acre NSL site, of which approximately 70 acres is landfilled (Figure 1-1).

NSL is a privately owned and operated active solid waste disposal facility. The site has been active since at least 1962 and has accepted various industrial and municipal wastes during the course of its operation. The vice president of NSL has estimated 16 million gallons of hazardous wastes have been disposed of in the landfill. A 3-acre oil separation lagoon on the landfill surface is evident in a 1977 aerial photograph. The site has had recurring operational deficiencies as reported by ISBH. The EPA detected leachate running into Finley Creek, and groundwater contamination was detected in monitoring wells at the site. The site was placed on the National Priorities List in 1983.

ECC began operations in 1977 and was engaged in the recovery/reclamation/brokering of primary solvents, oils, and other wastes received from industrial clients. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Reclamation processes included distillation, evaporation, and fractionation to reclaim solvents and oil.

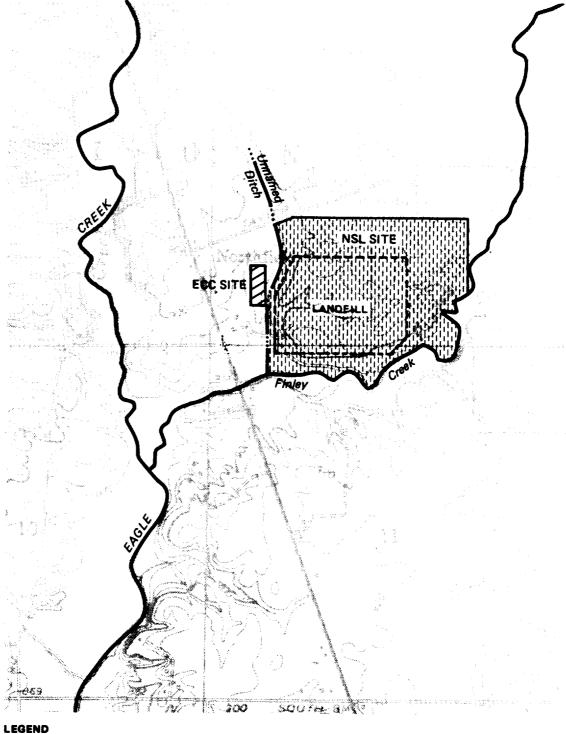
Several memorandums from ISBH discuss the disposal of ECC wastes in the NSL landfill. ECC wastes reportedly disposed of at NSL were 5,000 gallons/month of wastewater from the ECC oil reclamation process, still bottoms and solvent recovery waste, 50 to 80 drums/day of paint sludge, thinner, stain and resin sludge, and at least 7,000 drums of unreported contents.

Drum shipments to ECC were halted in February 1982 after EPA and ISBH investigations showed accumulation of contaminated stormwater onsite, inadequate management of drum inventory, and several spill incidents. EPA subsequently conducted removal actions at ECC including removal, treatment, and disposal of cooling pond waters, about 30,000 drums of waste, 220,000 gallons of hazardous waste from tanks, and 5,650 cubic yards of contaminated soil and cooling pond sludge.

SITE DESCRIPTION

The area surrounding the sites is largely undeveloped. Land use to the east and south of the site is agricultural, to the west and north it is residential. Approximately 50 residences are within 1 mile of the site.

An unnamed drainage ditch that separates NSL from the ECC site flows into Finley Creek near the southwest corner of the landfill (Figure 1-2). Finley Creek discharges into Eagle Creek about one-half mile downstream of the site. Eagle Creek then flows south for about 9 miles before emptying



NSL SITE ECC SITE

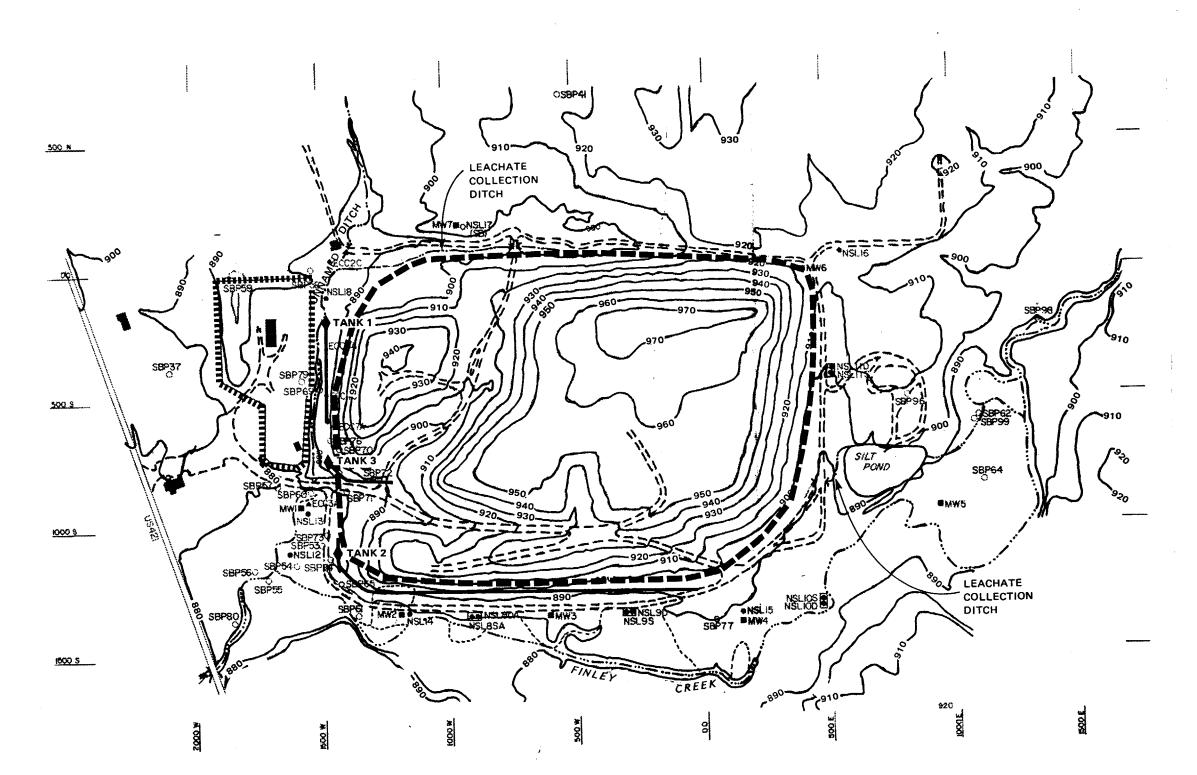
LANDFILL AREA

SITE BOUNDARY

SOURCE:

U.S.G.S. 7.5 min.quad-rangle, Roseton, Ind. 1969.





LEGEND

- -900- CONTOUR LINES
- FIE LANDFILL ROADWAYS
- CREEKS
- FORMER CREEK AND DITCH BED
- --- → DRAINAGE DITCH
- **♦** BURIED LEACHATE COLLECTION TANK
- BURIED LEACHATE TILES (APPROXIMATE LOCATION)
- BEBBB ECC SITE BOUNDARY
- APPROXIMATE BOUNDARY
 OF NSL LANDFILLED AREA

NOTES: This map is based on a 1983 topographic map from Harding Lawson Associates. Soil excavation has occurred on the northeast since that time. Former Finley Creek location based on maps from M.E. AYDT, P.E., 08-22-79 and the Indiana State Board of Health.

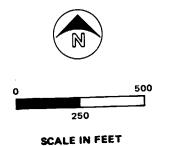


FIGURE 1-2 SITE FEATURES ECC - NSL CAA into the Eagle Creek Reservoir, which is used by the City of Indianapolis for a portion of its drinking water supply.

The surface of the landfill ranges from 30 feet to 70 feet above the surrounding grade. The sideslopes of the landfill are steep with shallow erosion gullies commonly present. Leachate seeps have been evident on all sides of the landfill. Two manmade ditches, one on the north side and one on the east side of the landfill, act as collection ditches for the leachate. The former ditch drains to the unnamed ditch and the latter drains directly to Finley Creek. The north ditch was observed during the remedial investigation to have a constant baseflow of leachate generated by the landfill. A leachate collection system consisting of three holding tanks and collection tiles was installed to control leachate discharges.

The landfill cover generally consists of silty clay till material that was borrowed from the area immediately north of the landfill. The cover is generally barren with some areas of sparse vegetation. It is fairly well compacted in areas that support vehicular traffic during operation. The surface is sloped to prevent ponding but shallow erosion gullies are evident in all areas of the cover. A shallow silt pond east of the landfill collects surface runoff from the eastern portion of the site and discharges to Finley Creek. The NSL site is not fenced nor is access to the site strictly controlled.

The ECC site is covered with a silty clay cap except in the southern third of the site where a concrete pad used during site operation is still in place. A sump in the southeast corner of the site collects contaminated water beneath the concrete pad. The ECC process building is in the northern half of the site. Access to the site is restricted by a surrounding fence.

REMEDIAL INVESTIGATIONS

Remedial investigations including soil, hydrogeologic, surface water, and sediment investigations of the sites began in 1983 and continued to November 1985. Details of the investigations are included in the ECC and NSL Remedial Investigation Reports.

HYDROGEOLOGIC CHARACTERISTICS

Geology

The site geology is summarized from Shaver and Sunderman (1983). The sites and all of Boone County are located on the Tipton Till Plain. The Tipton Till Plain is an extensive flat to gently rolling area formed on ground moraine

glacial till deposited during the Wisconsinan glacial advance. In general, 150 to 200 feet of glacial till overlies Devonian limestone and dolomite bedrock.

The till deposits consist mainly of dense silty clays that contain scattered and discontinuous deposits of sand, gravel, and silty sand at varying elevations. These coarse grain deposits appear to be glacio-fluvial and lacustrine in origin and form discontinuous lenses within the till.

A sand and gravel lens which extends beneath the ECC site and the southwest corner of the NSL site has a thickness of approximately 4 to 24 feet and a base elevation of 850 to 865 feet. The top of this lens is near the land surface in the southwest corner of the NSL site.

A continuous layer of sand and gravel, 2 to 15 feet thick, has been identified near the base of the till deposit. This layer is typically encountered at depths of 150 to 200 feet below land surface.

Hydrogeology

Because of the thin and discontinuous nature of the sand and gravel deposits within the till unit, it is not expected that they will act as a single water-bearing unit that will influence the overall movement of groundwater beneath the site. The permeable sand and gravel zones may be characterized by localized confined groundwater conditions, and groundwater movement through the sand and gravel zones may occur at velocities that are greater than the average for the overall till unit. For this combined alternative analysis, the till unit has been considered as a single water-bearing unit.

The sand and gravel lens beneath the ECC site and the southwest corner of the NSL site is near the land surface in the vicinity of Finley Creek and therefore forms a pathway for contaminated groundwater to discharge directly to the creek. Because of this, and because the thickness and continuity of the lens is greater than other sand and gravel lenses encountered in the test borings, this lens has been considered as a discrete water-bearing unit within the glacial till.

The water-bearing units beneath the site can be summarized as follows:

o The water-bearing unit beneath the landfill (except in the southwest corner) consists of glacial till that contains discontinuous lenses of sand and gravel which do not constitute a separate water-bearing unit.

- o In the southwest corner of the landfill, the sand and gravel lens is of sufficient thickness and continuity to be considered as a discrete water-bearing unit. It is overlain by a water-bearing unit of glacial till and is underlain by glacial till that is much less permeable than the sand and gravel.
- o The continuous layer of sand and gravel near the base of the till deposit at depths of 150 feet to 200 feet below the land surface constitutes a deep, confined water-bearing unit.

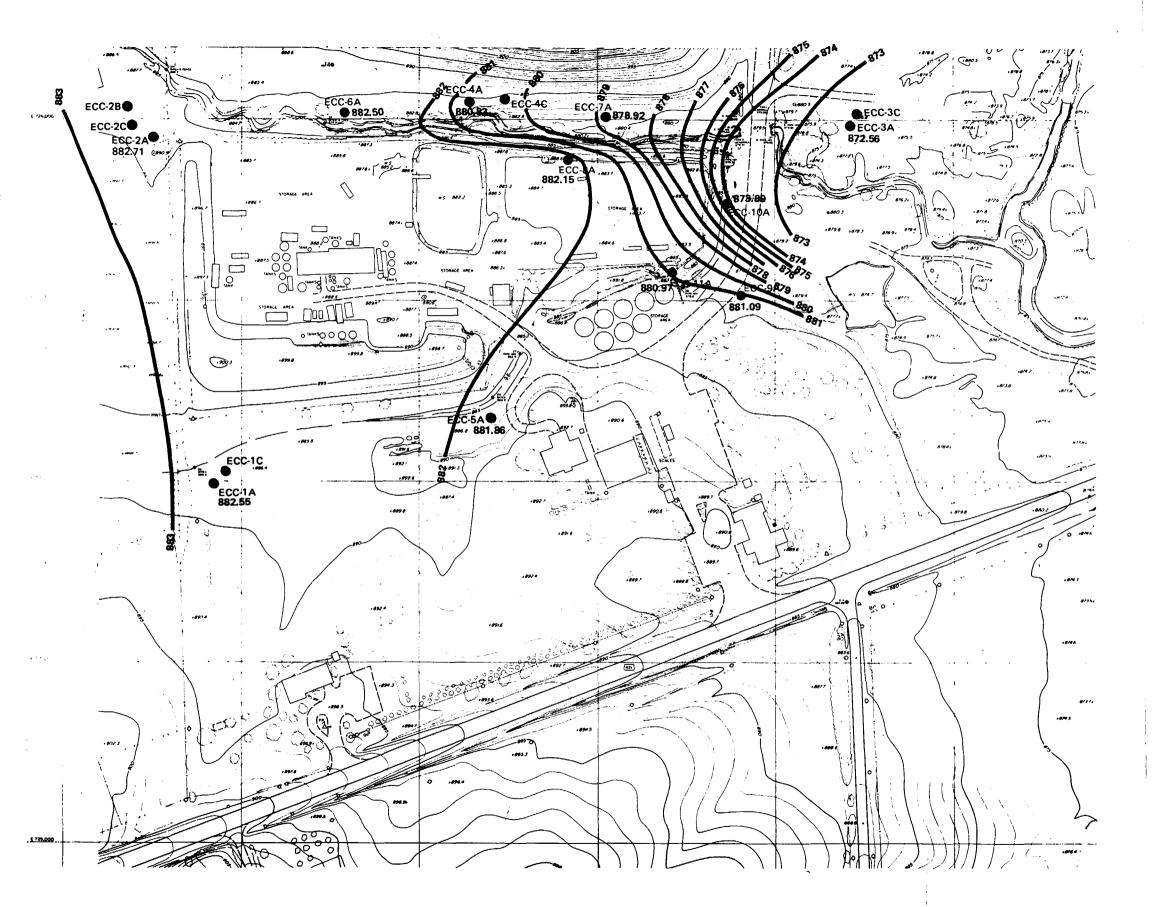
Groundwater levels in wells at the ECC site indicate that there is a vertical upward hydraulic gradient from the shallow sand and gravel lens to the overlying water-bearing till deposit. The water table beneath ECC is located in the till overlying the sand and gravel. Potentiometric surface contours for the shallow sand and gravel lens beneath the ECC site are shown in Figure 1-3. There are not enough data at ECC to allow for contouring of the water table in the till.

Groundwater in the glacial till water-bearing unit beneath NSL is unconfined. Contours of the water table in the till are shown in Figure 1-4. Groundwater in the sand and gravel lens in the southwest portion of the site is unconfined where the sand and gravel is at the ground surface.

Regional groundwater flow is from the northeast to the southwest with regional discharge at Eagle Creek (Shaver and Sunderman, 1983). At NSL, shallow (to approximately elevation 850 feet) groundwater flow directions are affected by discharge to Finley Creek and unnamed ditch. The Finley Creek discharge areas south and east of the site and the unnamed ditch west of the site cause groundwater to flow radially outward from the northeast corner of the landfill (Figure 1-4). Groundwater in the till probably discharges into the large sand and gravel lens beneath the southwest corner of the landfill, and then into Finley Creek and the unnamed ditch. At other locations, groundwater in the till probably discharges directly into Finley Creek and the unnamed ditch.

Groundwater beneath ECC appears to move south and discharge to Finley Creek or the unnamed ditch near its confluence with Finley Creek. Groundwater along the southeast edge of the ECC site appears to move in an eastern direction and discharge into the unnamed ditch. Based on the groundwater contours in Figures 1-3 and 1-4, the unnamed ditch appears to be a groundwater discharge area between the ECC and NSL sites.

Groundwater discharge areas have been identified as areas where upward gradient conditions exist or where the water



LEGEND

REMEDIAL INVESTIGATION MONITORING WELL ECC-7A

=882 = CONTOURS FOR DECEMBER 1984 DATA

NOTE: Map represents topography and onsite features prior to surface cleanup.

All well locations are approximate.

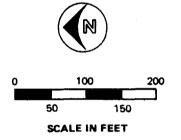
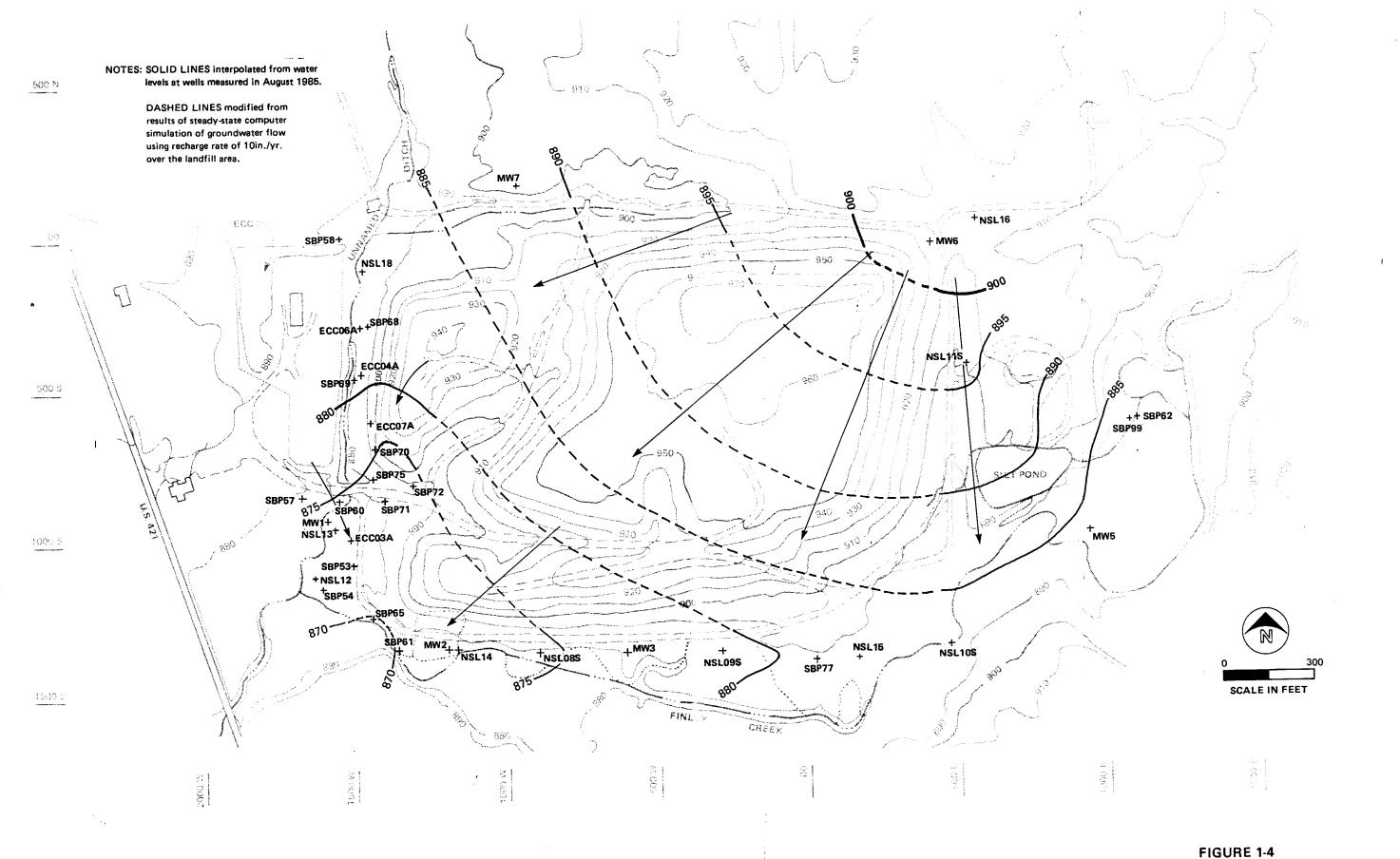


FIGURE 1-3
SHALLOW SAND AND GRAVEL UNIT
GROUNDWATER CONTOUR PLAN
DECEMBER 1984
ECC-NSL CAA



GLACIAL TILL UNIT
GROUNDWATER CONTOUR PLAN
ECC.NSL CAA

table is higher than the water levels in Finley Creek or the unnamed ditch. Almost all locations along Finley Creek and the unnamed ditch satisfy at least one of these conditions. However, the potential for groundwater to flow underneath the creek does exist. Water level measurements at comparable depths on both sides of the creek are needed to confirm it as a discharge area. This work requires the placement of nested wells on the south side of Finley Creek.

Groundwater level measurements from the deep confined waterbearing unit indicate a general north to south direction of groundwater movement. The potentiometric surface of the unit is above the ground surface, which indicates that the vertical hydraulic gradient from the deep confined unit is upward.

West (1982) reports the hydraulic conductivity of the silty-clay portions of the glacial till unit to be on the order of 10 to 10 cm/s. The hydraulic conductivities of lenses of coarse-grained deposits within the till have been estimated to be on the order of 10 to 10 cm/s (see NSL FS Report Appendix B). The difference in hydraulic conductivities of the till and coarse-grained lenses, coupled with the horizontal bedding of the coarse-grained lenses, results in a preferential horizontal groundwater flow direction.

Based on computer modeling results (see NSL FS Report, Appendix B), the water table in the till beneath the NSL site may be mounded, but when the computed mound elevations are compared with the prelandfill surface contours, only localized contact between groundwater and the landfilled refuse is expected. If the mound extends into the fill, it is unlikely that the saturated thickness within the fill is large because of the typically permeable nature of refuse. A limited thickness of perched water and leachate may exist at the interface between the landfill refuse and the ground surface. Perched fluid within the landfill proper (above the till) may be the primary source for leachate springs on the landfill sides.

NATURE AND EXTENT OF SITE CONTAMINATION

ECC Site

RI Results. Onsite soil sample inorganic analysis results showed only antimony, cadmium, cobalt, copper, lead, manganese, and zinc were present at concentrations exceeding their typical range in soil. Of these, cadmium, lead, and zinc were reported in more than one sample at concentrations exceeding their typical range in soils. Exceeding typical ranges in soil samples of inorganic constituents beneath the concrete pad is considered minor relative to the soil contamination in the northern drum and tank storage areas.

Inorganic contamination of the soil is apparently greatest in the near-surface (0-3 feet) soil in northern portions of the site. Inorganic contamination does appear to extend to depths of at least 5 feet in the northern portions of the site, although it is less widespread with depth than observed in the overlying near-surface soil.

Primary organic contaminants found in site soils are volatile organic compounds (VOC's) and phthalates. These compound groups are the most widespread organic contaminants and are generally present in the highest concentrations. Total VOC's ranged from 16 to 14,600,000 ug/kg. Total phthalates ranged from "not detected" to 370,000 ug/kg. Organic contamination decreases in the variety of compounds and their associated concentrations with depth. However, organic contaminants were detected to the maximum depth of sample analysis (8.5 feet).

Migration of soil contaminants to the water-bearing till has occurred onsite as evidenced by high levels of organic contaminants in one well onsite completed in the till. sand and gravel deposit below the till has been shown to be contaminated with inorganics and organics in one well downgradient to the south of ECC and near the southwest corner of NSL and lesser amounts of organics in one well onsite and another immediately adjacent to and south of the site. of the presence of the NSL site east of ECC, the source of offsite contamination near the southwest corner of NSL could be either ECC or NSL. The offsite contaminants are consistent with those found at both sites. Organic contamination in the other two wells is likely due to onsite soils at ECC since they are directly downgradient of ECC-contaminated soils.

Contamination of the sand and gravel deposit may have occurred either by vertical migration through the silty clay till onsite or through contaminated water and sediment in the former cooling water pond. The cooling pond had intersected the sand and gravel deposit before removal of contaminated water and sludge and backfilling with clean soil during removal actions.

The deep confined aquifer below the ECC site has not been found to be contaminated. Future migration of casite contaminants to the deep aquifer is highly unlikely because of an upward vertical hydraulic gradient from the aquifer.

Migration of contaminants to the nearest residential wells north, west, and south of the ECC site is not indicated by the results of the residential well sampling.

Surface water sampling results indicate that cyanide at levels below 30 ug/l is the only inorganic contaminant found in the

surface water of the unnamed ditch and Finley Creek. The source of the cyanide may be either NSL or both ECC and NSL since cyanide was also found upstream of ECC. Inorganic sediment contamination is limited to chromium and lead in the unnamed ditch and Finley Creek. Since these contaminants were found upstream as well as downstream of ECC, the source may be NSL. It is possible that downstream of ECC, these sediment contaminants could also have originated from ECC.

Organic contamination of offsite surface water was found in Finley Creek near Highway 421. Contaminants consist almost entirely of chlorinated hydrocarbons and may be from ECC. A sample in Finley Creek upstream of the ECC drainage area but downstream of NSL did not show organic contamination. Also, surface water ponded on the ECC silty-clay cap onsite was found to be contaminated with a variety of semivolatiles and VOC's. The Indianapolis Department of Public Works has also sampled Finley Creek near Highway 421 as well as at several locations in Eagle Creek. Samples taken in 1986 and analyzed for VOC's show similar VOC contamination in Finley Creek as that reported in the ECC RI report. Contamination of Eagle Creek was not found in any of the samples taken.

Sediment from Finley Creek near Highway 421 contained two VOC's and several semivolatiles at levels up to 300 ug/kg. Sediment samples upstream of ECC yet downstream of NSL did not show similar organic contamination. These data imply the source of the organic sediment contamination is ECC although sampling was not extensive enough to be certain.

Contaminant Transport and Fate. Analytical results of the remedial investigations characterize current site contamination. Future conditions assuming no action is taken at the ECC site were estimated based on potential transport pathways and the natural attenuation and degradation of contaminants. Transport and fate of selected VOC's, phenols, phthalates, and polychlorinated biphenyl's (PCB's) were estimated. Transport of inorganic constituents from the soil is considered negligible because of the low levels found and the anticipated adsorptive capacity of the onsite soils.

Degradation of VOC's in soil is highly variable. If leaching is prevented, most of the selected volatiles will degrad? to below detectable levels relatively rapidly (possibly within 10 years). Several of the selected volatiles will take much longer to degrade to below detectable levels. Degradation products such as vinyl chloride, however, may pose new risks. Phenols and phthalates in the subsurface soil are already at trace levels. PCB's will tend to persist in the soil at the site.

Under existing site conditions, the volatiles, phenols, and certain phthalates will tend to leach from subsurface soil into the groundwater and slowly migrate to the unnamed ditch or Finley Creek (PCB's and most phthalates will likely only leach in trace amounts). Estimates for travel time vary from 10 years to over 1,000 years depending upon the compound, hydraulic conductivity, and travel distance. Once in the surface waters, contaminants will either volatilize, adsorb to sediment, degrade, or experience dilutions on the order of 20:1 before reaching the Eagle Creek Reservoir, about 9 miles downstream.

NSL Site

Specific contaminant types and quantities disposed of at the NSL site are largely unknown. Data are also unavailable to locate the burial areas within the 70-acre landfill with the exception of the oil separation lagoon.

Soil samples collected from the surface and subsurface soil samples from around the periphery of the landfill did not show inorganic concentrations above background soil concentrations. Organic contamination was not found in the surface soil samples of the landfill cover material. Organic contamination of subsurface soil was found in borings nearest the landfill in the southern and southwestern portion of the site. The major organic contaminants found were VOC's and semivolatiles. VOC's detected included toluene, trichloroethene, and trans-1,2-dichloroethene at concentrations of about 10 to 51 ug/kg. One boring, however, contained toluene at 140,000 ug/kg. Semivolatiles were detected at concentrations of 300,000 to 400,000 ug/kg.

Leachate seeps, leachate sediment, and leachate collected in the existing leachate collection system at NSL were found to have inorganic and organic contamination. Inorganic contaminants found in leachate include chromium, nickel and lead. Organic contaminants in leachate included a variety of VOC's reaching 44,000 ug/l and semivolatile concentrations reaching 650 ug/l. Organic contaminants in leachate sediment included VOC's up to 760 ug/kg and semivolatiles up to 90,000 ug/kg.

Groundwater VOC contamination was found at all shallow NSL wells screened in the glacial till. VOC concentrations were as high as 1,100 ug/l. Semivolatiles were also found in nearly all wells in the glacial till though concentrations of individual compounds did not exceed 100 ug/l. Numerous VOC's were detected in the sand and gravel near the southwestern portion of the site at concentrations up to 100 ug/l. Because this area is also downgradient from ECC, contamination would be from ECC, NSL, or a combination of the two.

Inorganic contamination of groundwater in the glacial till and the sand and gravel in the southwestern corner of the NSL site included lead and nickel above background levels at several wells. Arsenic, chromium, and cyanide were also found at levels above background in at least one well.

Surface water and sediment contamination in the unnamed ditch and Finley Creek were described for the ECC site. In addition to the contaminants discussed, PCB's were detected in sediment of the old Finley Creek beds south of NSL at 1,800 ug/kg.

Contaminant Transport and Fate. Since the contamination within the landfill cannot be quantified, it is not possible to estimate future releases of contaminants nor the resulting effects on the surrounding media. Contaminant types and concentrations in the future may be very different from those currently observed in the monitoring wells and soil samples taken along the site perimeter. Over time, contaminants at the site perimeter would be expected to increase to a maximum level and then decline to background concentrations. The RI data do not show whether contaminant levels are on the increase or decrease at the NSL site. In addition, reliable estimates of the future leachate concentration and the time period from the initial landfilling to maximum groundwater contaminant levels, or to background levels, cannot be made.

It is possible that if contaminant types or levels increase, the time period before which concentrations permanently decrease to nonhazardous levels may be 100 years or longer. This unknown time period must be considered when evaluating remedial action alternatives.

Limitations of the Feasibility Study

Knowledge regarding the extent and degree of offsite contamination is limited by these factors:

- o Groundwater from both sides of Finley Creek is believed to discharge into the creek; wells (or piezometers) will be installed south of the creek to confirm this assumption.
- o Landfill gas was not sampled and analyzed and therefore cannot be confirmed as a hazard either onsite or offsite.
- o The inability to predict future contaminant levels from NSL.

The first two of these data gaps should be filled before final design of remedial actions.

SUMMARY OF THE ENDANGERMENT ASSESSMENT

The endangerment assessments found that under the no action alternative potential risks to human health and the environment exist at the ECC and NSL sites. The affected media are soil and landfill contents, leachate, groundwater and surface water and sediment. They were assessed based on comparison of concentrations at potential exposure points to excess lifetime cancer risks, acceptable daily intake values, and relevant or applicable standards, criteria, or guidelines. The NSL assessment did not quantitatively assess exposures that could occur as a result of new releases of contaminants from the landfill, because the nature, quantity, and locations of hazardous wastes within the landfill are not known. An excess lifetime cancer risk of 1 x 10 is often used to reflect a level of concern for carcinogen risk.

The risk analysis performed for the endangerment assessment is conservative and tends to reflect upper bound exposures. However, given the uncertainty in both risk estimation and fate and transport calculations, the actual risks may be lower or higher than estimated. Summaries of the risks associated with the ECC and NSL sites are presented in Tables 1-1 and 1-2, respectively.

The exposure pathway potentially affecting the greatest number of people is release of contaminants to Finley Creek from groundwater or landfill leachate and their subsequent transport to Eagle Creek Reservoir. Current contaminant concentrations measured in groundwater and in Finley Creek do not result in levels posing a threat to human health when they reach the drinking water intake of the reservoir. based on the evaluation of contaminant concentrations assuming dilution only. Further reductions in contaminant levels would be expected from volatilization, adsorption, and degradation. Contaminant concentrations in groundwater and in Finley Creek, however, could increase in the future either as a result of contaminant migration from source areas or as a result of new contaminants created in degradation processes. It is possible that threats to human health could occur in the future for the population served by the Eagle Creek Reservoir.

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Table 1-1 (Page 1 of 2) SUMMARY OF ECC EXPOSURE PATHWAYS AND ASSOCIATED RISKS

Operable Unit	Exposure Pathways	Associated Risks
SOIL		
o Surface Soil	Direct contact, inhalation, and ingestion of surface contaminants.	Soil cover material was not found to be contaminated before place-ment onsite. Contaminated ponded
	Transport of contaminants offsite as dust and runoff.	water on the cover indicates cover may contain contaminants.
		Potential exists for adverse health effects though data does not exist to quantify risk.
o Subsurface Soil	Future development onsite or erosion could result in direct contact, inhalation, and ingestion of contaminants.	If development or erosion occur, potential for adverse health effects from exposure exists. Excess lifetime cancer risks for ingestion range from 4 x 10 ⁻³ to 8 x 10 ⁻⁶ ; however, development in close proximity to a landfill is not considered likely.
GROUNDWATER	Installation of potable well within the zone of contamination could result in direct contact, inhalation, and ingestion of contaminants.	Potential for adverse health effects from long-term exposure; several MCL's exceeded. Excess lifetime cancer risks range from 4 x 10 ⁻¹ to 7 x 10 ⁻⁵ for ingestion of current or projected ground-water contaminants. Excess lifetime cancer risks range from 4 x 10 ⁻¹ to 7 x 10 ⁻⁷ for dermal absorption of current or projected contaminant concentrations.

Table 1-1 (Page 2 of 2)

Operable Unit	Exposure Pathways	Associated Risks
	Discharge of contaminants to surface waters.	Potential for adverse health effects from ingestion of fish bioconcentrating contaminants at projected surface water concentrations. Excess lifetime cancer risk of 1 x 10 to 3 x 10 . Projected concentrations exceed WQC for protection of human health from ingestion of aquatic organisms.
		Current or projected concentrations of contaminants in surface water do not result in a threat to aquatic life as measured by ambient water quality criteria and LC ₅₀ values.
	Possible migration of contaminants to a deep aquifer.	Groundwater gradients are upward and this pathway is not possible.
SURFACE WATER AND SEDIMENT	Direct contact, inhalation and ingestion of contaminants.	Excess lifetime cancer risk from dermal absorption of VOC's in surface water is less than 1×10^{-6} .
	Transport of contaminants down- stream to Eagle Creek Reservoir.	Current or projected future concentrations in surface water and sediment do not suggest a threat to human health via ingestion. Degradation products, such as vinyl chloride, however, may increase in the future and could pose a threat to human health.

Table 1-2 (Page 1 of 4) SUMMARY OF NSL EXPOSURE PATHWAYS AND ASSOCIATED RISKS

Operable Unit	Exposure Pathways	Associated Risks
Soil and Landfi'l Contents		
o Landfill Surface	Direct contact, inhalation, and ingestion of surface contaminants. Transport of contaminants offsite as dust and runoff.	None. Based on a limited number of samples, the landfill surface does not appear to be contaminated.
o Landfill Contents and Subsurface Soil	Future development onsite or erosion of the landfill surface could result in direct contact, inhalation, and ingestion of contaminants.	Potential exists for adverse health effects; however, development in the proximity of the landfill is highly unlikely.
o Leachate Sediment and Sediment in Old Creek Beds of Finley Creek	Direct contact, inhalation, and ingestion of contami- nants. Transport of contami- nants as dust and runoff.	Potential exists for adverse health effects resulting from long term exposure to contaminants. This is based on one leachate sediment sample which contained lead and chlordane and one creek bed sediment sample which contained PCB's.

Table 1-2 (Page 2 of 4)

	Operable Unit	Exposure Pathways	Associated Risks
Leach	nate		
0	Leachate Seeps	Direct contact, inhalation, and ingestion of contami- nants. Discharge of contami- nants to surface waters.	Current risk to public health and environment is negligible since long term ingestion and use of the leachate liquid is highly unlikely. However, leachate seeps represent the potential for future release of contaminants which could result in adverse health effects for humans and adverse effects on the aquatic ecosystem in the surface waters.
0	Leachate Liquid in Collection System	Direct contact, inhalation, and ingestion of contami- nants.	Current risk to public health and environment is minimal since long term exposure is highly unlikely. Potential exists for contamination to increase from future releases.
0	Landfill Liquid	Future development onsite could result in direct contact, inhalation, and ingestion of contaminants.	Potential exists for adverse health effects; however, development in the proximity of the landfill is highly unlikely.

Table 1-2 (Page 3 of 4)

Operable Unit	Exposure Pathways	Associated Risks
Groundwater	Installation of a potable well within the zones of contamination could result in direct contact, inhalation, and ingestion of contaminants.	Potential for adverse health effects from long-term exposure; however, installing a potable well on or near the landfill is unlikely. Several MCL's exceeded excess lifetime cancer risk of 1 x 10.
·	Discharge of contaminants to surface waters.	Concentrations of contaminants in groundwater do not currently suggest a threat to aquatic life as measured by ambient water quality criteria and LC ₅₀ values.
		However, potential for increasing contaminant types or levels in groundwater and surface water could result in adverse effects on public health and aquatic life.
	Possible migration of contami- nants offsite.	Groundwater is believed to discharge to Finley Creek. In this case, risk from offsite migration is negligible. If additional investigations indicate that groundwater is flowing under Finley Creek and to the south, the risk would be reevaluated.
	Possible migration of contami- nants to a deep aquifer.	Based on data from ECC site investigation, the gradients are upward and this pathway is not possible.

Table 1-2 (Page 4 of 4)

Operable Unit	Exposure Pathways	Associated Risks				
Surface Water and Sediment	Contact or assimilation of contaminants by aquatic life.	Concentrations of contami- nants in the surface waters and sediment do not cur- rently suggest a threat to aquatic life as measured by ambient water quality criteria and LC ₅₀ values.				
		However, potential for increasing contaminant types or levels in groundwater and surface water could result in adverse effects on public health and aquatic life.				
	Direct contact, inhalation, and ingestion of contami-nants.	Concentrations of contami- nants in the surface waters and sediments do not cur- rently suggest a threat to human health. Ingestion and use of water in Finley Creek and the unnamed ditch are highly unlikely. Increases in contaminant types or levels in future could result in adverse health effects.				
	Transport of contaminants downstream to Eagle Creek and Eagle Creek Reservoir, a water supply source.	Concentrations of contaminants in the surface waters and sediment do not currently suggest a threat to human health. Future release of contaminants to the surface waters may change the concentrations and risk to public health could occur.				

Chapter 2 ASSEMBLY OF REMEDIAL ACTION ALTERNATIVES

Remedial action goals are developed and presented in the ECC and NSL FS Reports to address each of the site hazards identified for the sites. These goals are summarized in this chapter and are the basis for the combination of alternatives presented later.

REMEDIAL ACTION GOALS

Remedial action goals are identified for each of the following operable units: soil and landfill contents, landfill leachate, groundwater, and surface water and sediment.

Remedial Goals for Soil and Landfill Contents

o Minimize Direct Contact--Minimize risk to public health and environment from direct contact inhalation or ingestion of NSL landfill contents, contaminated surface or subsurface soil on ECC and NSL, NSL leachate sediment and sediment in the old creek beds of Finley Creek.

Remedial Goals for Leachate

- o Minimize Direct Contact--Minimize risk to public health and environment from direct contact with NSL leachate liquid in the collection system and leachate seeping from the sides of the landfill.
- o Control Migration to Groundwater--Minimize and mitigate leaching of contaminants from the ECC contaminated soil or the landfill contents into the groundwater to adequately protect health of potential receptors using the groundwater at or near the site.
- o Control Migration to Surface Water--Minimize and mitigate the overland migration of contaminants from leachate seeps to the unnamed ditch and Finley Creek to adequately protect public health and environment from surface water and sediment contamination, ingestion of contaminated aquatic life, and direct contact with leachate liquid.

Remedial Goals for Groundwater

o <u>Minimize Direct Contaminant Consumption--Minimize</u> current and possible future risk to public health

from direct consumption of contaminated groundwater.

Control Migration to Surface Water--Manage migration of contaminated groundwater to the unnamed ditch and Finley Creek so public health and environment are adequately protected from surface water and sediment contamination and ingestion of contaminated aquatic life.

Remedial Goals for Surface Water and Sediment

Control Migration to Surface Water--Minimize and mitigate the threat to the environment and public health from direct contact, inhalation, and ingestion of contaminants in surface water and sediment resulting from future release of hazardous substances from landfill leachate and groundwater discharge.

ASSEMBLY OF REMEDIAL ACTION ALTERNATIVES

Alternatives developed for the NSL and ECC sites and described in detail in the respective feasibility studies are listed in Table 2-1. This table presents a matrix of alternatives versus major technologies and the combined alternatives for the CAA. Since each of the NSL or ECC alternatives contains many individual components, the possible combinations far exceed the eight CAA alternatives developed. The CAA alternatives are intended to represent a wide range, both in terms of cost and public health and environmental benefits, of alternatives that are applicable to meeting the remedial action goals. Numerous variations of the alternatives are possible and should be considered when selecting the preferred alternative.

OBJECTIVES OF ALTERNATIVES

The main objectives of each CAA alternative are discussed below. The alternatives are described in detail later in this chapter.

Alternative 1--No Action

The No Action Alternative is required by the NCP to be carried forward. It provides a baseline for comparison of other alternatives.

Alternative 2--Access Restrictions With Soil Cover and Leachate Collection and Treatment

Alternative 2 includes deed restrictions, fencing, a soil cover over the landfill to promote revegetation, a soil cover over the ECC site, disposal of sediment on NSL, rerouting

		/			NSL A	ALTER	NATIVE	s		//			ECC	ALTER	NATIVE			J	//	·		CAA A	LTERNA	ATIVES			
		No Action	Leachate Collections with Soil Cover and	Access Restrictions with RCRA Car	Leachate Collections with Sc.	Restr	Ception and Treatment Acess Restrictions	and Treatmer	Candfill Serrictions with Onsite ACAA	Action	Access Restrictions	Capping	Groundin	Groundware	Soil Excava:	Soil Excavation and Disposal Offsite.	Collection and Treatment County American	No Action	Access Restrictions	Access Restriction	Access Restriction	Interception and Treatment Access restricts	Interception and Treatment Access Reserving	Isolation and Treatment Lears Restricts	Isolation and Treatment and ECC C	ollection of Treatm tion	Landfill strictions with Onsite RCRA
	1	/ 2	3		4 /	5	6	7	// 1	<i>i</i> / 2	2 /	3	4	5	6	7	.	1 /	2	3	4	5	6	7	8	9	
ACCESS RESTRICTIONS Deed Restrictions, Fencing and Long-Term monitoring of groundwater, leachate, unnamed ditch and Finley Creek		x	×	>	«	x	×	х		x	,	× ;	x	×	x	x			×	х	x	×	×	x	x	×	
SURFACE CONTROLS Excavating/Capping old Creek beds and rerouting unnamed ditch and Finley Creek		×	x	,	<	×	×	х											x	×	x	x	x	x	X	x	
Soil Cover (Silty Clay)	1	×		<u></u>	(X	х	X	×			X		×						
CONTAINMENT RCRA Cap			· x			x	×	х			,	×								x		×	×	x	x	×	
SOIL REMOVAL/DISPOSAL Landfill Excavation and Onsite disposal in RCRA Landfill								x																		×	
ECC soil excavation and offsite disposal at RCRA facility									}						х					}							
SOIL TREATMENT/DISPOSAL ECC soil insitu treatment with soil vapor extraction														х										X			
ECC soil incineration and disposal onsite	<u> </u>							ļ	<u> </u>	<u> </u>				ļ	ļ	X	41-				_		 	-	. X		_
LEACHATE COLLECTION French drain system along NSL perimeter		×	×	;	×	X	х												X	x	×	x	. x	x	х		
GROUNDWATER COLLECTION French drain and extraction well system to intercept groundwater before migration offsite				>	ĸ	x							х	х	х	х					x	P _x					
French drain and extraction well system to lower water table below zone of soil contamination							x																х	х	Х		
LEACHATE/GROUNDWATER TREATMENT Precipitation biological treatment and carbon adsorption treatment with discharge to Finley Creek		х	×	; ;	×	х	х												x	x	x	x	x	x	x	x	
Granular Activated Carbon Treatment with dis- charge to Finley Creek					,	, 							×	X	×	X											

COLLECTION SYSTEM CONSISTS OF FRENCH DRAINS ONLY

the surface waters, collection and treatment of the leachate seeps, and monitoring of the leachate, groundwater, and surface water. This alternative addresses all of the operable unit goals with two exceptions. It would not mitigate or minimize the leaching of contaminants from the landfill to the groundwater nor would it manage the migration of groundwater to the surface waters. The intent was to present a low-cost alternative that offers the lowest level of protection to public health and the environment. If contaminant concentrations in the proposed monitoring wells exceed applicable and relevant and appropriate requirements (ARAR's) limits, future remedial actions would be initiated.

Alternative 3--Access Restrictions With RCRA Cap and Leachate Collection and Treatment

Alternative 3 is identical to Alternative 2 with the exception of a RCRA cap over both sites in place of a soil cover. This alternative is intended to provide a greater level of protection by reducing contaminant migration to the groundwater through reduction in surface water infiltration while also meeting technical requirements of landfill capping for site closure under RCRA. Monitoring would still be necessary to detect migration of contaminants in the groundwater. The quantity of leachate migrating to the groundwater will be reduced significantly; however, the potential for future contamination of the groundwater remains. As with Alternative 2, if contaminant concentrations in the proposed monitoring wells exceed ARAR's, future remedial actions would be initiated.

Alternative 4--Access Restrictions With Soil Cover, Leachate Collection, Groundwater Interception, and Treatment

Alternative 4 is essentially identical to Alternative 2 with the addition of groundwater interception to mitigate the migration of groundwater contaminants offsite or to the surface waters. This alternative addresses the groundwater and surface water operable unit goals of providing adequate protection of public health and the environment from future contamination of the surface water. Leachate from NSL would continue to migrate to the groundwater so collection and treatment would be required indefinitely at NSL. At ECC, soil contaminants which leach to groundwater would be removed and treated, though treatment would also likely be required indefinitely (possibly for 100 years or more).

Alternative 5--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Interception, and Treatment

Alternative 5 includes leachate and groundwater interception and treatment with a RCRA cap over the sites. The objective of the cap is to minimize further leaching of soil or landfill

contaminants to the groundwater. This may eventually allow termination of the groundwater collection and treatment system, though leachate collection and treatment would continue to be necessary. The operational period of the collection and treatment system cannot be reliably estimated but would be less than the 100 years or more required for Alternative 4.

Alternative 6--Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment

Alternative 6 employs a groundwater collection system intended to lower the water table beneath the contaminated or potentially contaminated zones at both sites. Combined with a RCRA cap the alternative should eventually prevent further contamination of the groundwater and result in groundwater treatment of leachate only. However, the collection system would be operated indefinitely to maintain the lower water table. This alternative is intended to provide a greater level of protection to the public health and environment by reducing contaminant migration.

Alternative 7--Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction

Alternative 7 incorporates all the components and objectives of Alternative 6 with the additional treatment of ECC-contaminated soil. Because the alternative includes a RCRA cap over ECC combined with a lowering of the water table, the soil vapor extraction treatment would not likely result in a reduced groundwater treatment period relative to Alternative 6. This is because in either alternative leaching of soil contaminants to the groundwater is minimized by the cap and the lowering of the water table. The public health risk from direct contact with ECC-contaminated soil in the event of site development would be greatly reduced.

Alternative 8--Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

Alternative 8 incorporates the objectives of Alternative 7. ECC-contaminated soil, however, is treated by onsite incineration. This results in permanent destruction of organic contaminants.

Alternative 9--Access Restrictions With Onsite RCRA Landfill

Alternative 9 includes deed restrictions; excavation of the landfill contents, peripheral soils, sediments and ECC-contaminated soil; and disposal of the waste materials in an onsite RCRA-type facility. This alternative addresses all

the operable unit goals and provides the highest level of protection of all the alternatives. However, the risks of exposure during construction and implementation would be greater than any of the other alternatives.

ALTERNATIVE COMBINATIONS NOT INCLUDED

Several potential combinations of NSL and ECC alternatives were not included since they either did not satisfy the remedial action goals, or other combinations better satisfied the objectives intended. They are discussed below.

ECC Soil Excavation and Disposal Offsite

This soil operable unit response action of ECC Alternative 6 was not included in any CAA Alternative since it is costly (30-year present worth of \$3,700,000) and does not result in destruction of contaminants.

Incineration of NSL Landfill Contents and Contaminated Soil

Incineration of NSL landfill materials and contaminated soils was eliminated as a viable technology in the NSL FS Screening (see NSL FS Chapter 3). Several disadvantages of incinerating the entire NSL landfill are: the risk of exposure to contaminants during excavation, unknown contents of the landfill, lengthy time to implement and incinerate the solids, and the high cost (capital cost is estimated to be \$3 billion to \$5 billion. Incineration of isolated and heavily contaminated areas within the landfill could be accomplished at a much lower cost if such areas could be effectively located. Risks of exposure or offsite migration of contaminants during excavation would still be important disadvantages.

NCP ALTERNATIVE CATEGORIES

The NCP identifies several categories under which at least one alternative should be developed, to the extent that it is possible and appropriate. The categories are:

- 1. Alternatives for treatment or disposal at an offsite facility.
- 2. Alternatives that attain applicable or relevant and appropriate Federal public health and environmental requirements.
- 3. Alternatives that exceed applicable or relevant and appropriate Federal public health and environmental requirements.
- 4. Alternatives that do not attain applicable or relevant and appropriate Federal public health and environmental

requirements but will reduce the likelihood of present or future threat from the hazardous substances and that provide significant protection to public health and welfare and the environment. This must include an alternative that closely approaches the level of protection provided by the applicable or relevant appropriate requirements.

5. No Action alternative.

Table 2-2 shows the alternatives applicable to each category.

DETAILED DESCRIPTION OF ALTERNATIVES

ALTERNATIVE 1--NO ACTION

As stated previously, the No Action alternative is required by the NCP and provides a baseline for comparison of other alternatives. This alternative would result in the public health and environmental risks identified in the endangerment assessment.

ALTERNATIVE 2--ACCESS RESTRICTIONS WITH SOIL COVER AND LEACHATE COLLECTION AND TREATMENT

The major components of Alternative 2 are:

- o Access restrictions
- o Soil cover and surface controls
- o Monitoring
- o Leachate collection
- o Treatment

The site plan of Alternative 2 is shown in Figure 2-1.

Access Restrictions

Deed restrictions would be placed on the landfill property and would include the ECC site. The restrictions would prevent future development of the land to protect against direct contact with contaminants or further migration that would result from site excavation. The deed restrictions would also prohibit use of groundwater or installation of wells onsite. Access to the site would be controlled by completing the fencing around the site perimeter and posting of signs.

Soil Cover and Surface Controls

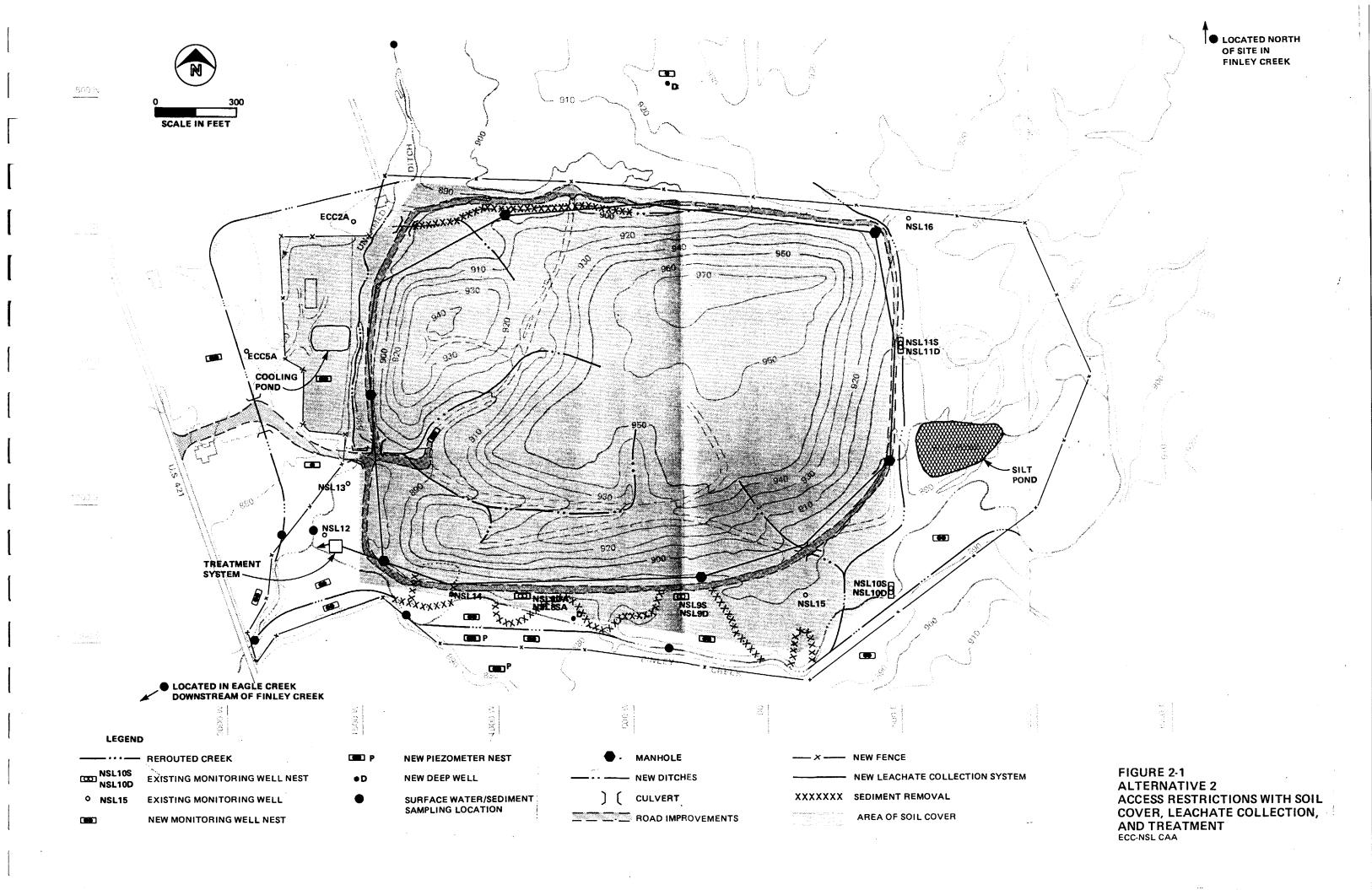
A soil cover and vegetation would be installed over the landfill and the ECC site to prevent erosion. The cover would increase evapotranspiration by allowing vegetative growth and prevent water ponding onsite. Prior to placing the cover, the sites would be graded to fill existing depressions,

Table 2-2 NCP ALTERNATIVE CATEGORIES

the transfer to the contract of the

				CA	A Alt	ernat	ives							
NCP Alternative Category			_2_	_3_	4_	_5_	6	7	8	9	Comments			
1.	 Treatment or disposal at an offsite facility. 										There is no reasonably implementable offsite disposal technology applicable to the landfill and ECC because of the large volume of waste material to be transported. Collection and offsite treatment of leachate and groundwater is possible but may be considerably more costly depending on pretreatment requirements and may not be implementable.			
2.	Attain applicable or relevant and appropriate Federal public health and environmental requirements.					x	X	X	x	x	These alternatives involve collection and treatment of leachate and groundwater to meet applicable criteria and include a RCRA type cap.			
3.	Exceed applicable or relevant and appropriate Federal public health and environmental requirements.								X	X	Incineration of ECC soil would exceed Federal requirements. Alternative 8 involves removing the sources of contamination and disposing of them in a RCRA-type landfill onsite.			
4.	Do not attain Federal requirements but reduce present or future threat and provide significant protection to public health, welfare or the environment.			X	X	X					Alternatives 2 and 3 may not attain Federal requirements since the groundwater is not collected and treated. Contaminants were detected in some wells at concentrations exceeding Safe Drinking Water Act Maximum Contaminant Levels (MCL's). Alternative 4 does not attain Federal requirements since it does not include a RCRA cap.			
5.	No Action.		X								Retained as a baseline for comparison.			

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eliminate sharp grade changes, and provide for site drainage. A 1-foot soil cover consisting of locally available till would be placed over the sites. The sites would be seeded with grass to prevent erosion and increase evapotranspiration.

About 4,200 cubic yards of leachate sediment and sediment in the ditch north of NSL and the old creek beds of Finley Creek would be excavated, dewatered, and disposed of onsite beneath the soil cover. It was assumed that excavation to a 1-foot depth would be necessary. The creek beds would be backfilled and a soil cover would be placed over the area. Contaminated water resulting from the dewatering of the sediment would be treated in the onsite leachate treatment system.

The unnamed ditch would be rerouted to the west of ECC and portions of Finley Creek would be rechannelized as shown in Figure 2-1. This would route the surface waters farther away from contaminated areas and increase the travel time for contaminants to migrate in the groundwater to the surface waters, thus increasing the likelihood of contaminant attenuation and degradation.

Monitoring

Contaminant migration would be assessed through a regular leachate, groundwater, and surface water monitoring program. Leachate would be sampled at the leachate collection sump as part of the leachate collection and treatment system. water would be monitored using 15 of the existing wells and an additional 26 new monitoring wells (see Figure 2-1). The total of 41 monitoring wells would be sampled quarterly the first 5 years and analyzed for the full organic and inorganic priority pollutant list. Subsequent sampling would be reduced to twice per year at all 41 wells. Samples would be analyzed for VOC's, semivolatiles and inorganics. Water levels of monitoring wells would be taken at the time of sampling and gradients would be calculated and compared to existing data. Surface water and sediment would be sampled at eight locations semiannually. These samples would be analyzed for VOC's, base/neutrals, pesticides, PCB's, and inorganics. Depending on surface water results, fish could be occasionally collected from Finley and Eagle Creek and their tissues analyzed for bioaccumulation of organic contaminants.

Leachate Collection

The leachate collection system would consist of a French drain encircling the landfill. The drain would be about 4 feet deep and 6,000 feet in length. Perforated pipe laid in the trench would be used to transport leachate to one of the several sumps. The trench would be backfilled with gravel. A 1-foot layer of gravel would also be placed on the sideslopes of the landfill to provide a drainage path for leachate seepage. The soil cover described previously would extend over the

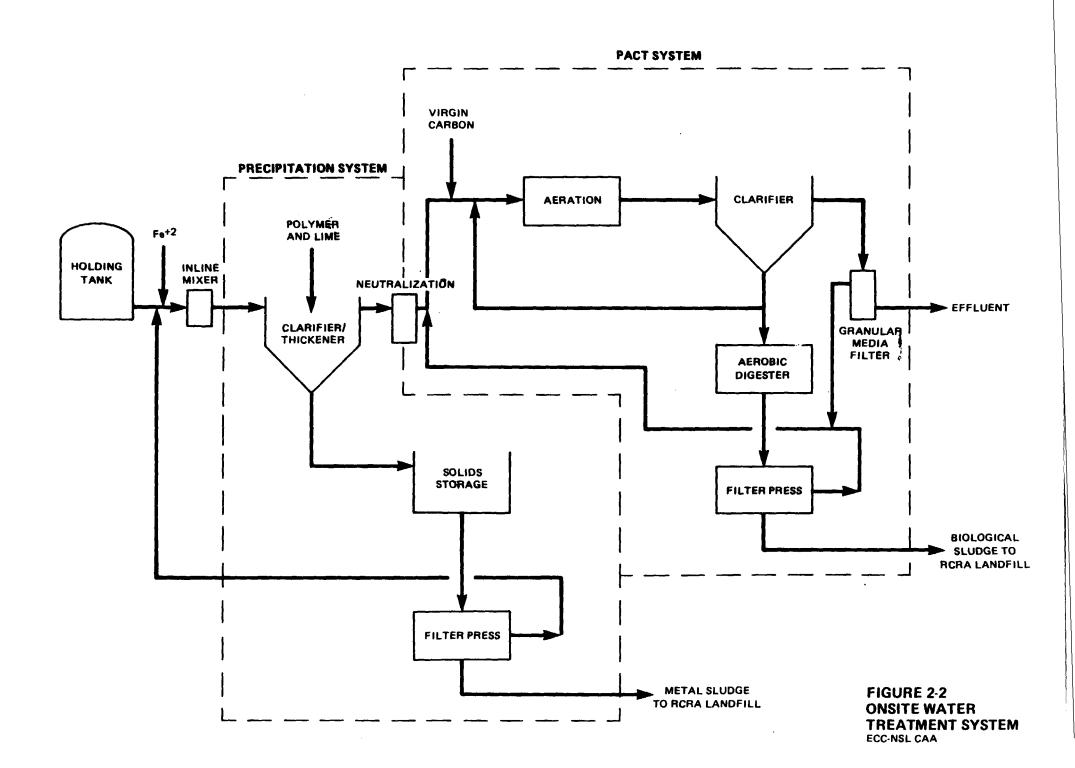
gravel layer and the drainage trench. The existing leachate collection system would be abandoned. The leachate collection system is discussed in greater detail in the NSL FS Report, Chapter 4 and Appendix B.

Treatment

The estimated flowrate of the leachate collection system is 40 gpm. The leachate would be pumped to an onsite treatment plant consisting of precipitation, biological oxidation, and carbon adsorption (see Figure 2-2). Leachate contaminant types and concentrations are discussed in the NSL FS Report, Appendix A.

In the treatment system, the waste stream will first pass through the precipitation process for removal of metals and other inorganics. Chromium, copper, iron, lead, and zinc were detected in the groundwater and leachate samples and can be removed by precipitation. The precipitation will be induced by the addition of chemicals. Both hydroxide and sulfide precipitation can be used effectively. Hydroxide precipitation will be used for cost estimating purposes for several reasons. Operationally, hydroxide would be added regardless for pH control, so only one chemical addition system would be required. Further, the presence of sulfide can pose a health risk in the effluent discharge or as an emission of hydrogen sulfide. However, bench testing prior to design would be required to determine what the appropriate precipitant would be. A polymer can also be added to enhance solids settling. Flocculation and clarification will follow the chemical addition and can be accomplished in one basin. Either flocculation with lamella gravity settlers or solids contact clarifiers could be used. Sludge will be removed from the bottom of the basin and can be thickened, dewatered with a filter press, and disposed of in a RCRA landfill.

Effluent from the precipitation process will then go through powdered activated carbon treatment (PACT) which is a patented activated carbon enhanced biological treatment system. PACT system combines biological treatment and carbon adsorption into one process. The system works through the addition of powdered activated carbon to the influent of the activated sludge process. The system consists of carbon feeding equipment, an aeration basin with the necessary appurtenances, a clarifier, and solids handling equipment. Solids would be wasted to an aerobic digester followed by dewatering. Solids would then be disposed of at a RCRA landfill unless they Spent carbon in could be delisted as a nonhazardous waste. the waste solids could be separated and regenerated offsite. Onsite regeneration facilities would not be cost effective, considering the small amount of carbon to be used.



Granular media filtration would be included in the treatment system following either the precipitation system or the PACT system or both. The advantage of having a filter after each unit would be that less metals would carry over into the PACT system and that solids with low settleability would be removed from the biological system effluent. For costing purposes, however, it is assumed that one filter will be used after the PACT system. Development of the treatment system is based on limited data. Pilot-scale and bench-scale testing would be necessary prior to implementation.

Effluent Discharge

Discharge of treated leachate would be to Finley Creek southwest of the NSL site. Discharge limits for treatment effluent are set during the NPDES permit process. NPDES permitting is handled by the Indiana Department of Environmental Management, Office of Water Management Permit Section. There is no list of standards or criteria applicable for all waterways. The permit considers the water use designation for the receiving water, waste load allocations, relevant state water quality standards, federal water quality criteria, and other scientific data.

Finley Creek and Eagle Creek are "waters of the State of Indiana" and have been given the aquatic life (warm water fishery) and partial body contact recreation water use designation. Any discharge of treated leachate and groundwater should help maintain those uses.

Indiana water quality standards are presented in 330 IAC-1-6. The minimum water quality conditions include conditions governing substances that affect aesthetic conditions, are acutely or chemically toxic, or otherwise cause injury to humans, animals, aquatic life or plants. The minimum water quality conditions for aquatic life apply outside the mixing zone to substances that affect taste or odor, are toxic (1/10 of the 96-hour LC₅₀), or that may bioconcentrate to result in exceeding FDA action levels for fish consumption. Because both Eagle Creek and Finley Creek seasonally may have no or low flow, no mixing zone will be considered and effluent discharges will be compared directly to criteria.

Table 2-3 lists criteria that may be used in setting the discharge limits. The first two categories (1/10 LC₅₀ and AWQC aquatic life) address aquatic population effects. The next category (AWQC aquatic life-human use) addresses human use of the fishery. The remaining criteria address human consumption of the water as a potable water source. Included for comparison purposes are the average concentrations of each contaminant detected in the leachate.

Table 2-3
WATER QUALITY CRITERIA APPLICABLE TO LEACHATE DISCHARGE

	Average Leachate Concentration (ug/1)	One-Tenth 96 hr LC	Protection Acute	of Aquatic ^e Life <u>Chronic</u>	Consumption of Aquatic Organisms	Drinking Water Act MCL's	AWQC Drinking Water ⁸
Benzene	106	2,440	5,300	•	40 ^b	5	0.67 ^b
Bis(2-Ethyl Hexyl)Phthalate	181	•	11,100	3	50,000 [®]	-	21,000
4-Chloro-3-Methyl Phenol	62	1.0	30		•	-	3,000 ^a
1,1-Dichloroethene	3	-	30,300 ^a	-	1.85 ^b	7	0.033
Methylene Chloride	1,250	19,300	193,000	-	15.7	-	0.19 ^b
Napthalene	20	15,000	23,000	620	0.0311	-	•
Phenanthrene	20	-	-	•	0.0311	- '	0.0028 ^D
Arsenic	6	-	360	190	0.0175	50	0.0025 ^b
Chromium (+6)	18	•	16	11	3,433,000	50	50 ^a
Copper	33	• •	42 ^C	11 26	•	1,000	1,000 ^d
Cyanide	-	•	22	5.2	-	•	200 ^a
Iron	32,600	-		1,000	•	300	
Lead	45	-	264 ^C	10°	-	50	50 ^a
Nickel	76	-	3,700°	10° 192°	100	-	15.4 ^a
Zinc	123	-	687 ^C	<u>47</u> °		5,000	5,000 ^a

NOTE: For calculation of average leachate concentrations, see NSL FS Report Appendix A.

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Based on toxicity concentration.

Based on carcinogenic protection at the 10 cancer risk level.

Contaminant concentration based on water hardness of 250 mg/l CaCO equivalent.

Based on published 96-hour median lethal concentration, (Verschueren, 1983).

1980 Federal Ambient Water Quality Criteria.

Proposed maximum concentration level. 81980 Federal Ambient Water Quality Criteria for protection of human health at the 10 cancer risk level.

___ Underline designates the lowest AWQ.

Because the NPDES permit process would consider all these factors, the feasibility study assumes treatment facility discharges must meet all of these categories.

Neither Finley Creek nor Eagle Creek are designated for domestic (potable water) uses. It does not appear that domestic use will be a reasonable future use of either creek. While Eagle Reservoir is a potable water source, permitted discharge to Finley Creek would undergo dilution of about 1,600 to 1 (assuming annual average daily flow at the reservoir of 150 cfs) by the time it arrives at the reservoir. Contaminant levels would be further reduced in the reservoir because of degradation and volatilization during the estimated minimum 45-day residence time. A conservative estimate of treatment system discharge limits for protection of drinking water use at the reservoir was made using the dilution factor multiplied by drinking water AWQC. The resulting values were all below the the applicable criteria underlined in Therefore, meeting the underlined applicable criteria in Table 2-3, will result in meeting drinking water criteria applied to contaminants at the reservoir.

Operation and Maintenance

Maintenance would be required for the soil cover because of erosion, freeze/thaw, and landfill settlement. It was estimated that every fifth year, 10 inches of fill over 50 percent of the landfill would need replacement. Routine inspections of the landfill surface and the leachate collection system would be required semiannually.

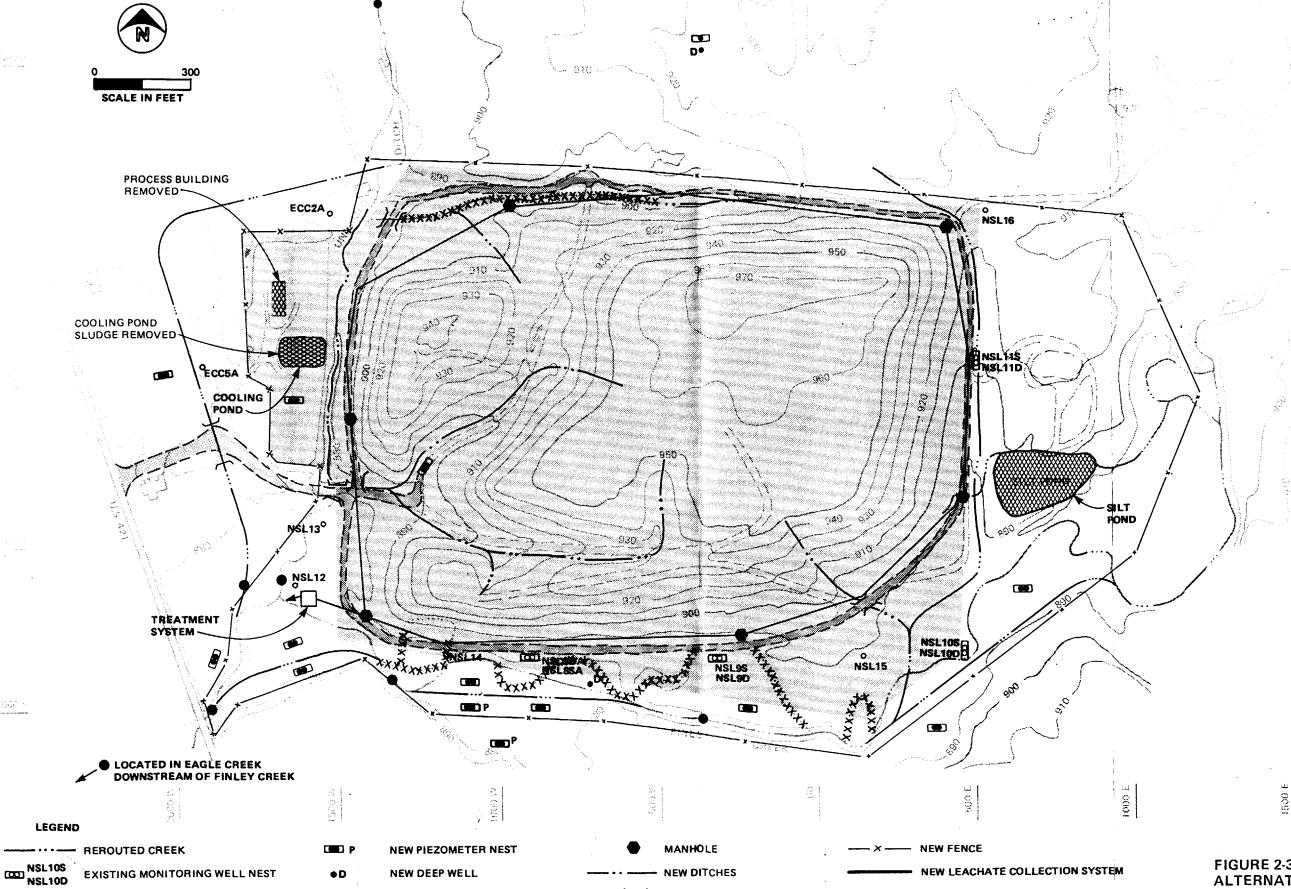
The treatment system would require a full-time operator to perform testing and maintenance, to adjust chemical and carbon feed rates, and to ensure that all process units are functioning properly. To provide for regular maintenance or in the event of treatment system failure, a 100,000 gallon holding tank is included. This tank provides a 2-day holding time for untreated leachate.

ALTERNATIVE 3--ACCESS RESTRICTIONS WITH RCRA CAP AND LEACHATE COLLECTION AND TREATMENT

The major components of Alternative 3 are:

- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Treatment

The site plan of Alternative 3 is shown in Figure 2-3.



EXISTING MONITORING WELL NEST

EXISTING MONITORING WELL O NSL15

1860 :

NEW MONITORING WELL NEST

SURFACE WATER/SEDIMENT SAMPLING LOCATION

- NEW DITCHES

) (CULVERT TT TO ROAD IMPROVEMENTS

XXXXXXX SEDIMENT REMOVAL AREA OF RCRA CAP

ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, AND TREATMENT ECC-NSL CAA

Access restrictions, surface controls, monitoring, and leachate collection and treatment are similar to Alternative 2.

Cooling Pond Sludge Removal

Before construction of the cap, any contaminated sludge or soil remaining in the former ECC cooling pond would be excavated and disposed of at a licensed RCRA landfill. Soil samples would be collected from soil borings in the former cooling pond and analyzed to determine excavation locations and volumes. Excavated sludge or soil would be replaced with clean fill. Removal of remaining contaminated sludge would prevent any further contamination of the sand and gravel deposit provided groundwater gradients remain upward. Groundwater removed during sludge excavation would be transported and treated at a licensed RCRA facility.

RCRA Cap

The RCRA cap would cover the same area as the soil cover of Alternative 2. It would consist of 1 foot of soil overlying 1.5 feet of a sand and gravel drainage layer. Below these would be a 30-mil synthetic membrane, 2 feet of clay, and 1 foot of sand (for gas collection on the landfill only). Prior to placing the cap, the site would be graded to eliminate sharp grade changes and to provide for drainage. Also the former process building on the ECC site would be demolished. The concrete floor and foundation would remain and the cap placed on top. The cap would be seeded to control erosion and promote evapotranspiration.

The RCRA cap is expected to reduce the rate of leachate production from 40 gpm to 5 gpm within 5 years. The resulting flowrate requiring treatment would also decrease from 40 gpm to 5 gpm.

Operation and Maintenance

Maintenance for Alternative 3 will be similar to Alternative 2. Repair and replacement of the RCRA cap will be required as with the soil cover and routine inspections of the cap and collection system would be necessary or a regular basis. A full-time operator would be required for the treatment system.

ALTERNATIVE 4--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT

The major components of Alternative 4 are:

- o Access restrictions
- o Cooling pond sludge removal
- o Soil cover and surface controls

- o Monitoring
- o Leachate collection
- o Groundwater interception
- o Treatment

The site plan for Alternative 4 is shown in Figure 2-4.

Access restrictions, soil cover and surface controls, leachate collection, and treatment are similar to Alternative 2. Cooling pond sludge removal would be as described in Alternative 2, although contaminated water removed during excavation could be treated in the onsite treatment system. Alternative 4 includes a groundwater collection system to intercept groundwater migrating to the surface waters or offsite.

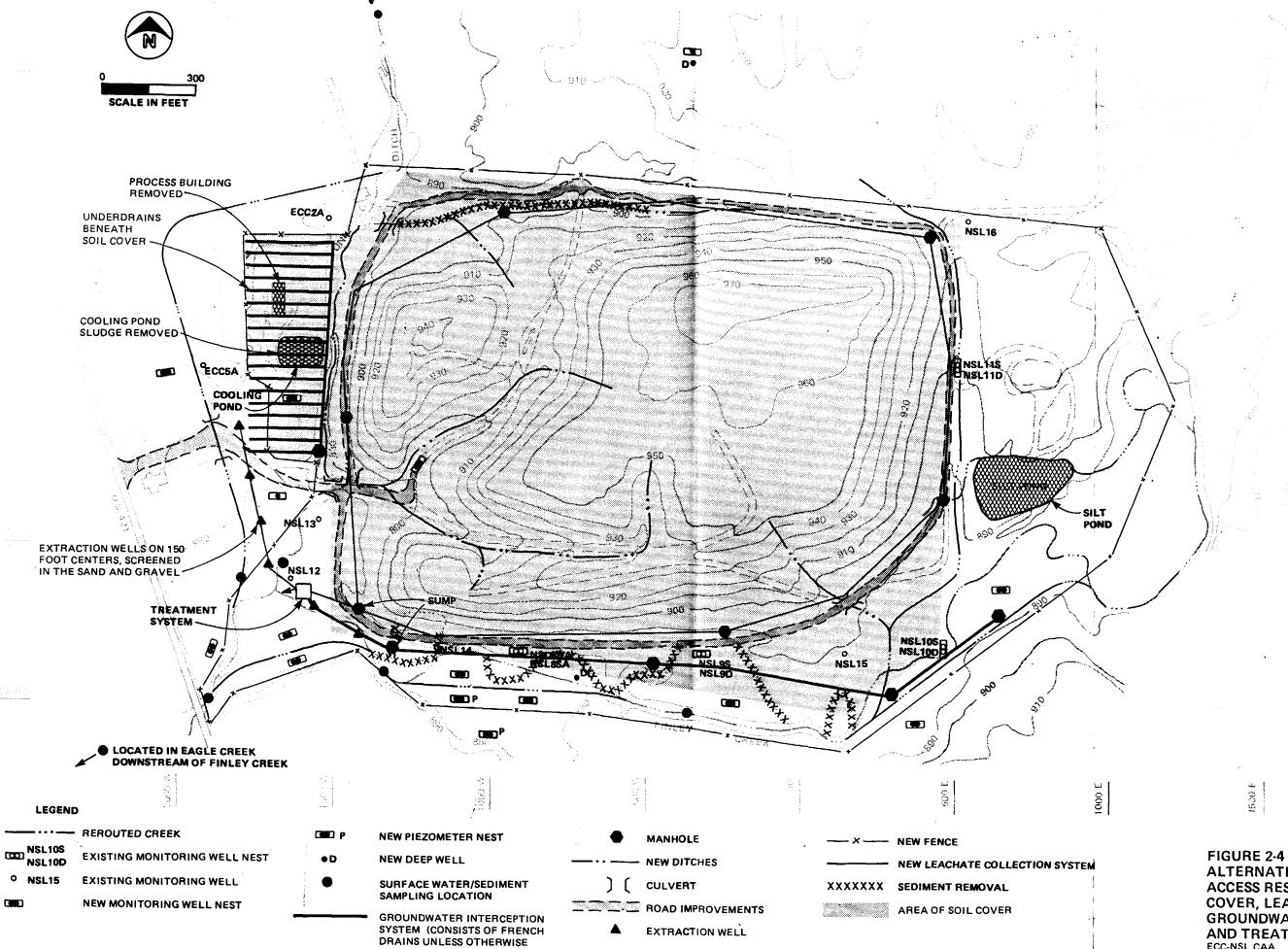
Monitoring

Monitoring of leachate and surface water and sediment would be as described for Alternative 2. Groundwater monitoring would also be similar for the first year. Following this, however, only 14 monitoring wells outside the perimeter of the groundwater collection system would be sampled on a semi-annual basis. The presence of the groundwater collection system allows the groundwater monitoring program to be less extensive. Water levels in monitoring wells and piezometers on either side of the collection system would be taken on a monthly basis.

Groundwater Interception

The groundwater collection system would consist of a French drain extending along the southern border of the landfill. The drain along Finley Creek would have an impermeable barrier along the south wall of the trench to minimize inflow of water from the creek. In the sand and gravel in the southwestern portion of the site, six extraction wells placed on 150-foot centers would be installed instead of a French drain. It is anticipated that an approximate 5-foot overall drawdown of the water table at the collection system would be sufficient to prevent groundwater movement past the system. Details of the collection system design are similar to those incorporated into NSL Alternatives 4 and 5 and are discussed in the NSL FS Report, Appendix B.

At the ECC site, a system of underdrains 40 feet apart would be constructed in the silty clay saturated zone (see Figure 2-4). The objective of the ECC underdrains is to collect the more heavily contaminated groundwater onsite in the till and to prevent it from migrating through the sand and gravel zone to the extraction wells south of the site. The 40-foot drain spacing was estimated on the basis of maintaining the existing upward vertical gradient from the sand and gravel deposit to



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ALTERNATIVE 4 ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT **ECC-NSL CAA**

the till to prevent downward migration of contaminants into the lower sand and gravel. Without the underdrains, the sand and gravel deposit beneath and south of the ECC site would be expected to become more heavily contaminated. Although this zone would eventually be purged of contaminants, it is considered more reliable and effective to minimize the migration of the groundwater contaminants. The ECC FS Report, Chapter 6 and Appendix B, presents additional detail on the design of the collection system.

Leachate and groundwater would be combined at the onsite treatment facility. Estimates of flowrates from each of the collection system components were generated using the available information on subsurface soil and groundwater conditions, and using the target drawdown of 5 feet along the collection system. The ECC underdrain would contribute an estimated 8 gpm, the French drain around NSL would contribute 25 gpm, and the six extraction wells would contribute 65 gpm. The leachate collection system would contribute 40 gpm. The estimated treatment flowrate is about 140 gpm.

The treatment system would be the similar to the one described for leachate in Alternative 2. Additional contaminants and flow would be expected from the groundwater collection system. To estimate average groundwater concentrations to be treated, projected concentrations of selected indicator contaminants found at the ECC site were combined with existing contaminant concentrations found at NSL. These are presented in Table 2-4 along with the leachate contaminant concentrations presented earlier for Alternative 2 and the applicable water quality criteria. As with Alternative 2, meeting the underlined criteria would result in also meeting drinking water criteria applied to Eagle Creek Reservoir.

Operation and Maintenance

Maintenance for Alternative 4 would be similar to Alternative 2. Some additional maintenance would be necessary to inspect and repair the French drains and periodically to redevelop collection wells and replace well pumps.

ALTERNATIVE 5--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT

The major components of Alternative 5 are:

- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater interception
- o Treatment

Table 2-4 WATER QUALITY CRITERIA APPLICABLE TO LEACHATE AND GROUNDWATER DISCHARGE OF ALTERNATIVE 4

				Applicable Criteria (ug/l)							
	Average	Average h					Drinking				
	Leachate	Groundwater			<u>.</u> e		Water	AWQC			
	Concentration	Concentration	One-Tenth		f Aquatic Life ^e	Consumption of e	Act f	Drinking			
	(ug/1)	(ug/1)	96 hr LC	Acute	Chronic	Aquatic Organisms	MCL's	Water			
1,1,1-Trichloroethane	1	2,300	5,280	18,000		1,030,000 ^a	200	19,000 ^a			
1,1,2-Trichloroethane	-	1.5	9,400	18,000	9,400	41.8	•	0.6			
Chloroform	•	11,	-	28,900	1,240	15.70	100	0.19			
Benzene	106	1041	2,440	5,300	-	3,280 a 15.7 b 1.85 b 80.7 b	5	0.67			
Ethylbenzene	101	350	4,230	32,000	•	3,280 ⁸	-	2,400			
Methylene Chloride	1,250	5,900,	19,300	193,000	•	15.7	•	0.19 ^b			
1,1-Dichloroethene	3	3 ¹	-	30,300ª	•	1.85	7	0.033			
Trichloroethene	1	5,800	4,020	45,000	-	80.7 ⁰	5	2.8			
Tetrachloroethene	-	230	1,840	5,280	840	8.85	10	0.8			
Toluene	26	1,800	3,400	17,500	-		-	15,000			
Phenol	149	4,400,		10,200	2,560	769 ,0 00 ^a	-	3,500			
4-Chloro-3-Methyl Phenol	62	_1	570 1.0	30	-	-	-	3,000ª			
Bis(2-Ethyl Hexyl)Phthalate	181	11	-	11,100	<u>3</u>	50,000	-	21,000			
DI-n-butyl Phthalate	12	9	•	940	=	154,000 ^a	-	44,000			
Diethyl Phthalate	33	7	-	52,100	-	1,800,000	-	434,000 ^a			
Dimethyl Phthalate	•	7.	-	33,000	-	2,900,000 ^a	-	350,000 ^a			
Napthalene	20	28,	15,000	23,000	620	<u>0.</u> 0311 D	-	•			
Phenanthrene	20	5 ¹	-	•	-	0.0311	-	0.0028			
Arsenic	6	25	-	360	190	0.0175	50	0.0025			
Chromium (+6)	18	5	•	16	11	3,433,000	50	50 ^a			
Copper	33	4	•	42 ^c	26 ^C	-	1,000	1,000 ^a			
Cyanide	-	15	-	22	5.2	•	•	200 ^a			
Iron	32,600	2,550	-		$ \begin{array}{r} \frac{11}{26}c \\ \underline{5.2} \\ \underline{1,000} \end{array} $	-	300				
Lead	45	22	-	264 ^C	192°	-	50	50 ^a			
Nickel	76	71	•	3,700°	· 192°	100	-	15.4ª			
Zinc	123	31	-	687 ^c	47°	-	5,000	5,000 ^a			

Based on toxicity concentration.

Based on carcinogenic protection.

Contaminant concentration based on water hardness of 250 mg/l CaCO equivalent.

Based on published 96-hour median lethal concentration, (Verschueren, 1983).

e 1980 Federal Ambient Water Quality Criteria. f Proposed maximum concentration level.

⁸1980 Federal Ambient Water Quality Criteria.

h Average groundwater concentration includes projected groundwater concentrations of selected contaminants

in till unit at ECC (see ECC RI Report, Chapter 5 (March 14, 1986) and existing groundwater concentrations

at NSL perimeter (see NSL FS Report, Appendix A).

Concentration not estimated for groundwater beneath ECC. Concentration represents NSL groundwater concentrations only.

Underline designates the lowest AWQ.

The site plan for Alternative 5 is shown in Figure 2-5.

The components for Alternative 5 are similar to Alternative 4 except that a RCRA cap is used instead of a soil cover. Also the French drain groundwater collection system in the fill at ECC is not included.

RCRA Cap

The RCRA cap was described under Alternative 3. The cap is estimated to reduce flow to the leachate collection system at NSL from 40 gpm to 5 gpm within 5 years.

Monitoring

Monitoring of leachate and surface water and sediment would be as described for Alternative 2. Groundwater monitoring would be similar to that described for Alternative 4.

Groundwater Interception

The groundwater interception system of this alternative has several differences from that described for Alternative 4 though the main objective of intercepting contaminated groundwater from the site remains the same. The interception system of Alternative 5 would be constructed so that it could function as a portion of a groundwater isolation system, if the isolation system becomes more advantageous in the future. The objective of groundwater isolation is to lower the water table below zones of soil contamination in the till unit. As a result, the isolation collection system of French drains would be installed at a lower elevation than the interception system. The isolation system is discussed further for Alternative 6.

The groundwater collection of Alternative 5 consists of a French drain installed along the southern and southwestern boundaries of the landfill and ECC to an estimated elevation of 865 (see Figure 2-5). The drain would include two collection pipes, one set 5 feet below the existing water table to function as the interception system, and the other set at the bottom of the trench to be used if the isolation system is implemented at a later time.

French drains replace extraction wells in the southwestern area of the site because a more expensive system of closely spaced wells would be required in an isolation system. The French drain, however, can be used for either system. The French drain would include an impermeable barrier on the south wall of the trench to minimize inflow of water from Finley Creek. The barrier would consist of an impermeable synthetic membrane and at least 6 inches of compacted clay. It would extend 3 feet into the till below the sand and gravel deposit in the southwest area of the site. The barrier would also extend 75 feet beyond the western end of the drain.

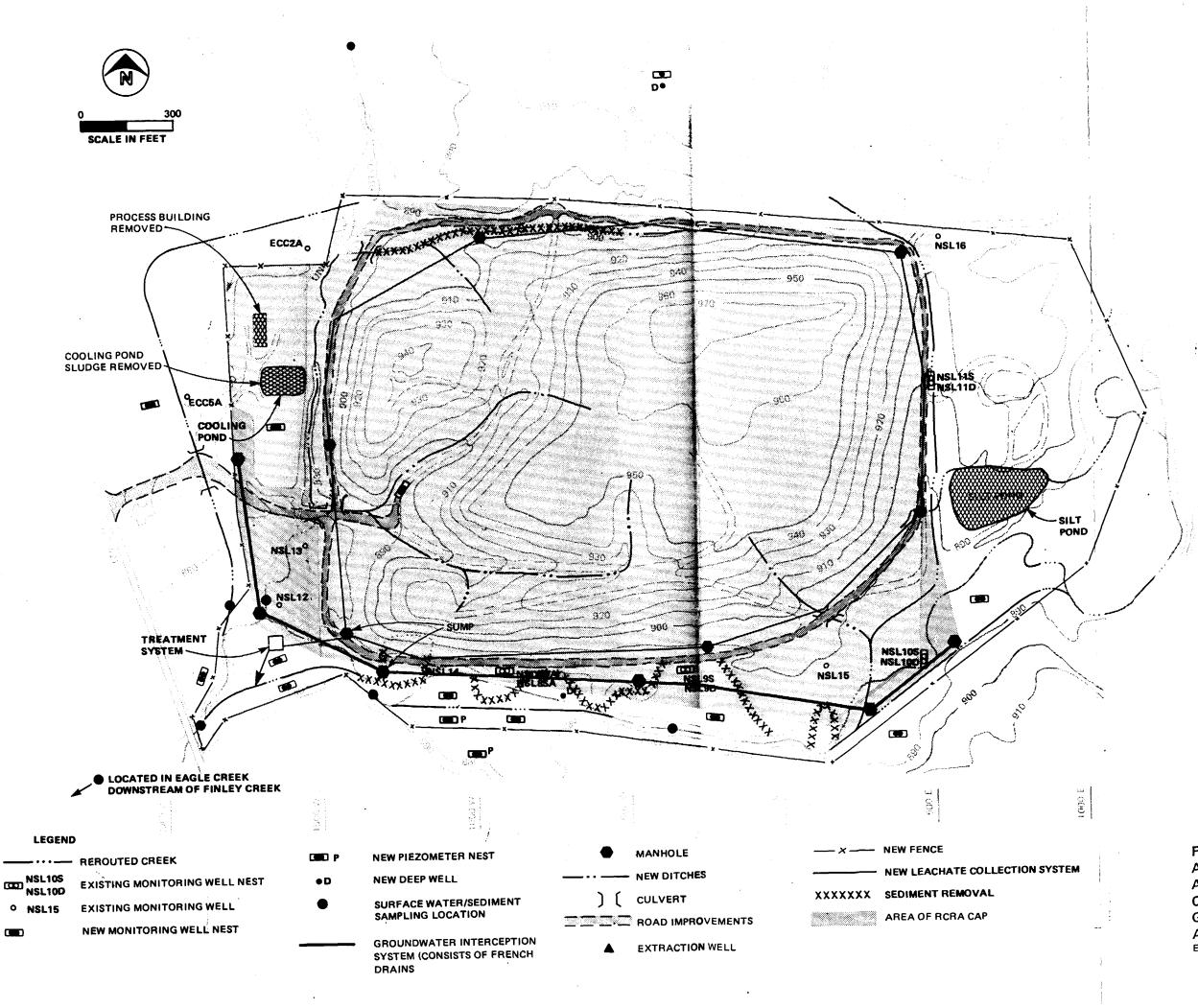


FIGURE 2-5
ALTERNATIVE 5
ACCESS RESTRICTIONS WITH RCRA
CAP, LEACHATE COLLECTION,
GROUNDWATER INTERCEPTION,
AND TREATMENT
ECC-NSL CAA

The system of underdrains at ECC is not included in Alternative 5 since the RCRA cap would minimize the generation of heavily contaminated groundwater in the till. Although contaminated groundwater in the till could still migrate through the sand and gravel to the groundwater interception system, contaminant levels would likely be much lower than those produced without a RCRA cap.

The initial combined flowrate from the leachate and groundwater collection systems is estimated to be 100 gpm with 40 gpm from the leachate collection system. Within 5 years, the flow is estimated to decrease to about 65 gpm because of a reduction in leachate generation.

Operation and Maintenance

The groundwater collection system operation and maintenance requirements of Alternative 5 are less than Alternative 4 because extraction wells are not used. Treatment system operation and maintenance is less than Alternative 4 since the flowrate is lower. Operation and maintenance of the RCRA cap would be as described for Alternative 3.

ALTERNATIVE 6--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION, AND TREATMENT

The major components of Alternative 6 are:

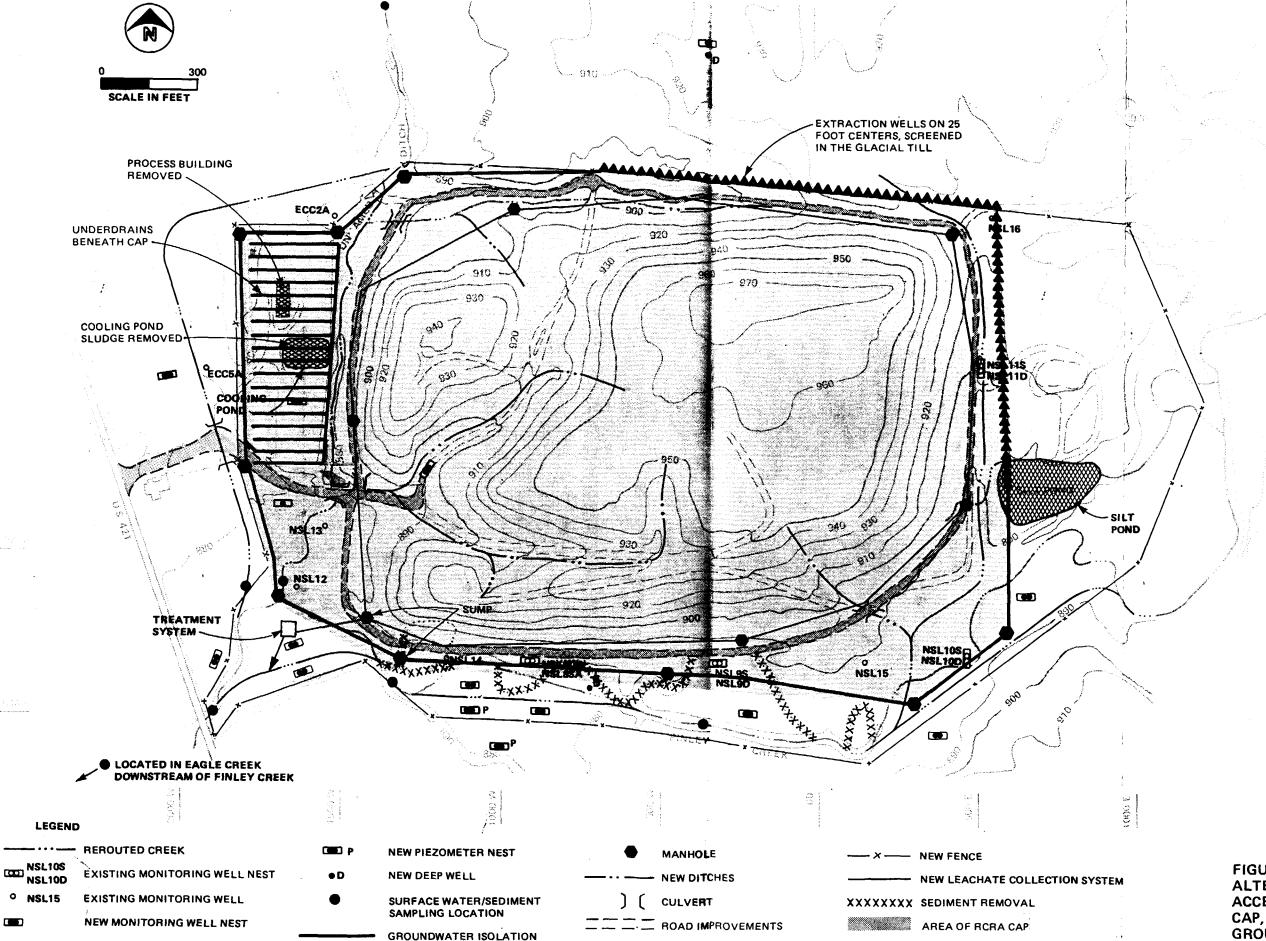
- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater isolation
- o Treatment

The site plan for Alternative 6 is shown in Figure 2-6.

The components for Alternative 6 are similar to Alternative 5 except that groundwater isolation is used in place of groundwater interception. The French drain groundwater collection system in the till at ECC is included in Alternative 6.

Monitoring

Monitoring of leachate and surface water and sediment would be as described for Alternative 2. Groundwater monitoring would be similar to that described for Alternative 4 with the exception of increased monthly monitoring of the water level on either side of the groundwater isolation system.



EXTRACTION WELL

SYSTEM (CONSISTS OF FRENCH DRAINS UNLESS

OTHERWISE NOTED)

FIGURE 2-6 **ALTERNATIVE 6 ACCESS RESTRICTIONS WITH RCRA** CAP, LEACHATE COLLECTION, **GROUNDWATER ISOLATION,** AND TREATMENT ECC-NSL CAA

Groundwater Isolation

The objective of groundwater isolation is to lower the groundwater table below zones of soil contamination in the till unit. Together with the RCRA cap, this would minimize the transport of contaminants in the groundwater since the source of contaminants to the groundwater would be nearly eliminated. The collection system for groundwater isolation would be placed along the boundaries of the site to completely encircle both ECC and NSL. A French drain would be used throughout, except in the northeastern corner of the Extraction wells would be used in the northeast corner because installation of French drains at the depth required for the collection system (40 feet) would be difficult. Eighty-two wells on 25-foot centers were estimated to be required in this area. The estimated desired elevation of the water table is 865 feet. elevation was chosen based on groundwater contamination observed in monitoring wells. The French drain along Finley Creek would have an impermeable barrier on the south wall of the trench to minimize inflow of water from the creek. Details of the groundwater isolation system are similar to those described for NSL Alternative 6 and are discussed in the NSL FS Report, Appendix B.

The underdrains at ECC are included in this alternative to prevent contaminated groundwater in the ECC till from migrating downward into the sand and gravel deposit under the initial strong downward gradients induced by the groundwater isolation system.

The underdrains at ECC would be similar in design to those of Alternative 4. The lower infiltration rate through the RCRA cap, however, would result in a water table near the bottom of the till. This would minimize any vertical downward gradient to prevent migration of the contaminated leachate to the sand and gravel deposit. The French drain to the south and west of the site would intercept the existing low level contamination in the sand and gravel deposit beneath and to the south of the ECC site.

Initially, the combined flowrate is estimated to be approximately 340 gpm with 40 gpm from the leachate collection system and 300 gpm from the groundwater collection system. Within 5 years, the flow is estimated to decrease to 200 gpm because of a reduction in leachate generation and lowering of the water table beneath the site to the desired elevation. Once the water table has reached the desired level, groundwater flow to the collection system will be primarily uncontaminated water from the site perimeter. It is anticipated that treatment will only be necessary for the leachate collected after this period (5 gpm).

Operation and Maintenance

The maintenance requirements of Alternative 6 will be very similar to Alternative 5. The additional wells and French drain required for the groundwater isolation will increase the maintenance somewhat; however, the operation and maintenance of the treatment system will decrease in the future, especially if only the leachate requires treatment.

ALTERNATIVE 7--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL VAPOR EXTRACTION

The major components of Alternative 7 are:

- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater isolation
- o Treatment
- o ECC soil vapor extraction

The site plan for Alternative 7 is shown in Figure 2-7. Alternative 7 contains all components of Alternative 6 and adds soil vapor extraction to remove volatile contaminants from soil.

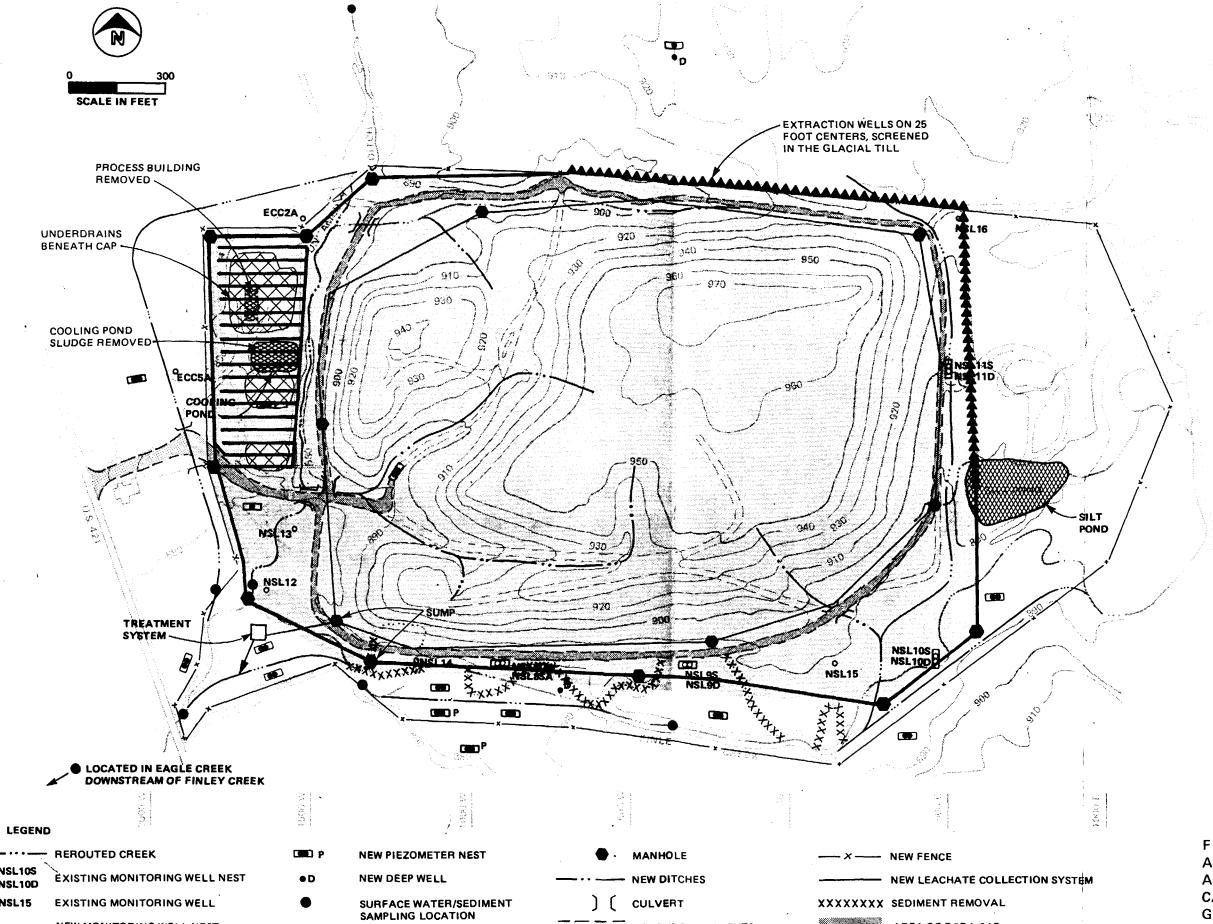
ECC Soil Vapor Extraction

Vapor extraction (or enhanced volatilization) would reduce the level of contamination in the unsaturated zone by inducing a flow of air through the soil to evacuate the volatile contaminants. Volatile compounds in the air stream would then be adsorbed in a granular activated carbon adsorber system.

Vapor extraction wells would be screened in the unsaturated zone. A vacuum is placed on the well and air extracted from the well. As more air is extracted from the soil, the pressure around the well is lowered. The lower pressure has two effects:

- o More contaminants are volatilized from the soil moisture into the soil gas.
- o Air is drawn through the inlet wells and through the contaminated soil to the extraction well.

With the clean source of air, and a system of wells with overlapping effects, the contaminants can be extracted from the unsaturated zone.



ROAD IMPROVEMENTS

EXTRACTION WELL

GROUNDWATER ISOLATION SYSTEM (CONSISTS OF FRENCH DRAINS UNLESS

OTHERWISE NOTED)

NEW MONITORING WELL NEST

AREA OF RCRA CAP

SOIL VAPOR EXTRACTION SYSTEM

FIGURE 2-7
ALTERNATIVE 7
ACCESS RESTRICTIONS WITH RCRA
CAP, LEACHATE COLLECTION,
GROUNDWATER ISOLATION AND
TREATMENT, AND ECC SOIL
VAPOR EXTRACTION
ECC-NSL CAA

Based on existing data, the system would consist of 10 networks of 8 air withdrawal (extraction) wells and 8 air inlet wells. They would be placed in areas that account for approximately 99.5 percent of the volatile contaminant mass in the unsaturated zone at ECC and include all areas where the volatile compound concentrations exceed the 1 x 10 excess lifetime cancer risk level from soil ingestion.

The extracted air would flow from the wells and into an air/water separator to remove any free water from the vapor stream. The air would flow from the air/water separator into a heater, where the temperature would be raised to 90°F, and then into the granular activated carbon adsorbers to remove the organic contaminants. Purified air would exit the carbon adsorbers through a vacuum pump and be discharged to the atmosphere.

The system described here is conceptual in nature. The exact number and placement of wells, withdrawal rate, and vacuum applied to each well will be based upon pilot testing before design. Additional soil sampling and analysis in the unsaturated zone would be performed to further delineate volatile distribution in the soil and aid in the optimal placing of wells.

Operation and Maintenance

Maintenance of Alternative 7 is similar to Alternative 6 except for the additional maintenance of the soil vapor extraction system.

The vapor extraction system would be monitored daily to assure that proper vacuums are being maintained. Additional routine maintenance of the pumps would be performed. In the pilot study stage and the initial stage of full-scale operations, daily sampling and analysis of the discharge air stream would be performed. In addition, at least three soil gas monitoring points would be installed at each network to allow monitoring of removal rates. Air samples would be analyzed by GC/MS. After the first week, monitoring could be reduced to weekly for the next 2 months and then biweekly to monthly for the duration of the operation. The initial samples would be analyzed for a complete volatile organic scan. Three or four key compounds can then be chosen and routine monitoring performed for them. Periodic complete volatile scans would be performed to monitor changes in discharge makeup.

Based on the monitoring of both the soil gas composition and the discharge stream, a system termination point can be chosen. It is estimated that the vapor extraction system may take 2 to 4 years to lower VOC concentrations below the 10 cancer risk level from soil ingestion.

ALTERNATIVE 8--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL INCINERATION

The major components of this alternative are:

- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater isolation
- o Treatment
- o ECC soil incineration

The site plan for Alternative 8 is shown in Figure 2-8. Alternative 8 contains all components of Alternative 6 and adds incineration of ECC-contaminated soil.

ECC Soil Incineration

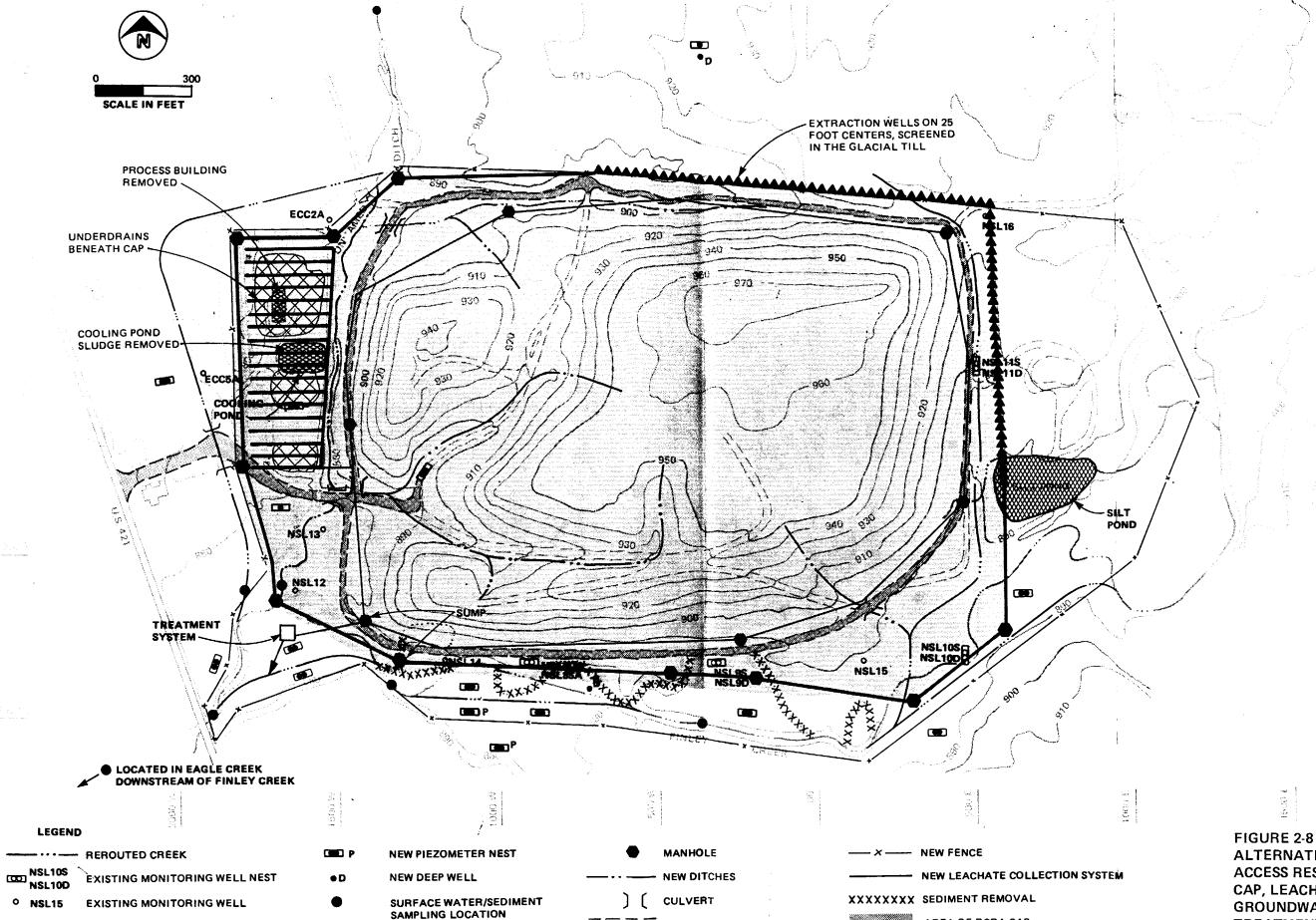
Soil with organic contaminant concentrations above 1×10^{-6} excess lifetime cancer risk levels would be incinerated onsite.

It is assumed here that the incinerated soil could be managed as though it were not a hazardous waste and be disposed of onsite. A RCRA cap would be placed over the incinerated soil replaced on the site.

The main components of the incineration process are the rotary kiln, afterburner, packed tower, and wet scrubber. The incineration facility would take approximately 1 year to design and install, and an additional 1 to 3 years for startup and permitting. Incineration of 14,400 cubic yards of soil and 7,500 cubic yards of the existing silty-clay cap (assuming a 15 percent moisture content) would take from 1.5 to 4 years at a throughput of 1 to 2 cubic yards per hour for 300 days per year. Operating the kiln continuously would reduce thermal stress on the refractory, although some down time has been allowed. After the soil has been treated, the incinerator would be dismantled and salvaged or reused on other sites.

The rotary kiln would operate at 2,200°F with a total wasteheat input of 23 million Btu/hour. Residence time of a waste material is a function of temperature, rotational speed, and kiln angle to horizontal. A trial burn conducted at the startup time will determine these factors along with the residence time. In general, solid wastes can take several hours for combustion. Rotary kiln systems usually have a secondary combustion chamber, or afterburner, following the kiln to ensure complete combustion of the waste and gases from the kiln. This chamber is usually designed to have a gas residence time of a few seconds with temperatures between 2,200 and 3,000°F.





TTTT ROAD IMPROVEMENTS

EXTRACTION WELL

GROUNDWATER ISOLATION

SYSTEM (CONSISTS OF

FRENCH DRAINS UNLESS OTHERWISE NOTED)

NEW MONITORING WELL NEST

AREA OF RCRA CAP

SOIL EXCAVATION AND INCINERATION

ALTERNATIVE 8 ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, **GROUNDWATER ISOLATION AND** TREATMENT, AND ECC SOIL **INCINERATION** ECC-NSL CAA

To operate, the kiln would require approximately 225 gallons per hour of supplemental fuel oil because of the low heating value of the soil. Electrical requirements for the complete system would be 130 kW. Water requirements would vary depending on the kiln and scrubber design. At most, approximately 450 gpm would be needed if the system included a venturi scrubber.

The contaminated soil would be ram fed or conveyed through the higher end of the kiln. As the kiln rotates, the incinerated soil moves to the lower end of the kiln where it is discharged. The residual ash would then be replaced onsite.

High levels of nitrogen oxide emissions are expected, especially when a rotary kiln is operated at higher temperatures. Nitrous oxides are formed from thermal fixation of nitrogen in the air used for combustion or from organic nitrogen compounds present in the waste. Emissions of nitrogen oxide and particulate matter are dependent on the waste. Sulfur oxides are formed from sulfur present in the waste material and auxiliary fuel. A wet scrubber is assumed to be necessary for control of emissions of particulate matter and the gaseous products of combustion.

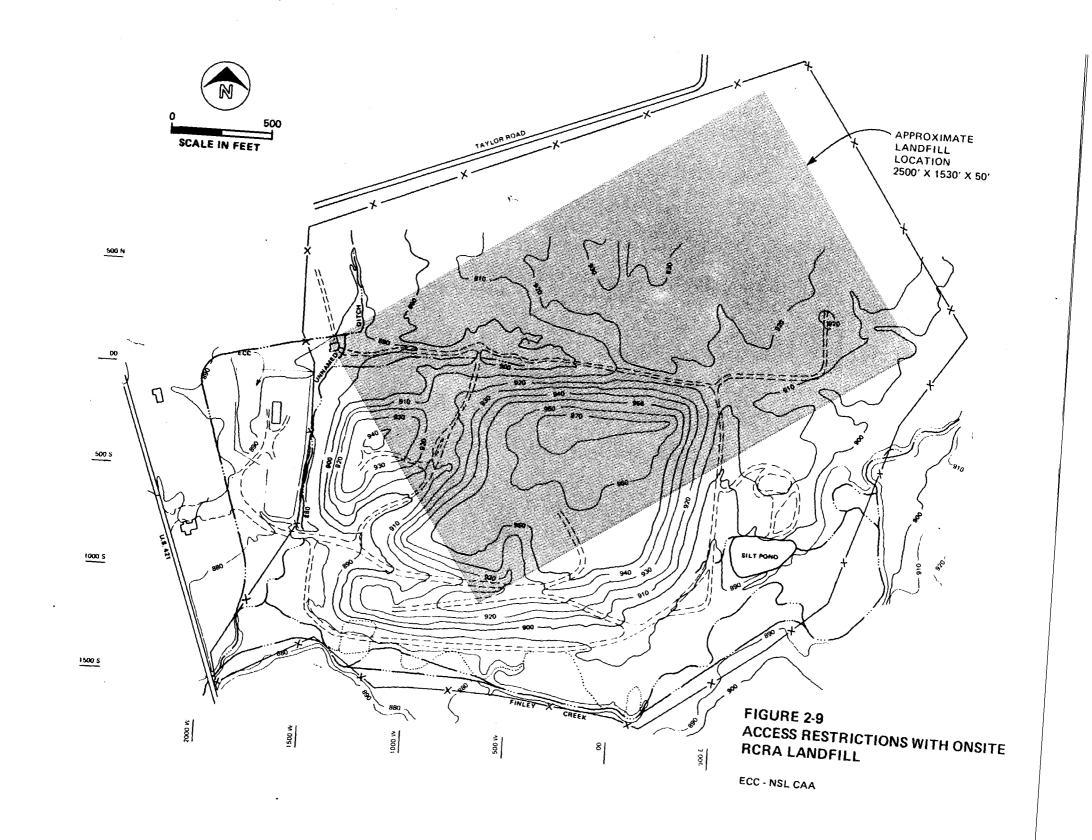
ALTERNATIVE 9--ACCESS RESTRICTIONS WITH ONSITE RCRA LANDFILL

The major components of this alternative are:

- o Access restrictions
- o Rerouting of surface waters
- o Monitoring
- o Construction of RCRA landfill
- o Excavation of contaminated soil, landfill contents, and sediment

This alternative involves the excavation of the landfill contents, contaminated soils around and under the landfill, and ECC-contaminated soils with subsequent placement in an onsite RCRA landfill. The landfill would be located in the northern portion of the Northside Landfill site as shown in Figure 2-9.

A RCRA-type landfill would include construction of the following: a double liner, leachate collection system, leachate and groundwater monitoring system, gas collection system, and multimedia cap. The general scheme of a RCRA-type landfill is shown in Figures 2-10 and 2-11. As of this writing, the northern portion of the site (which was used as a borrow pit) has been excavated down to elevation 900 to 920. This



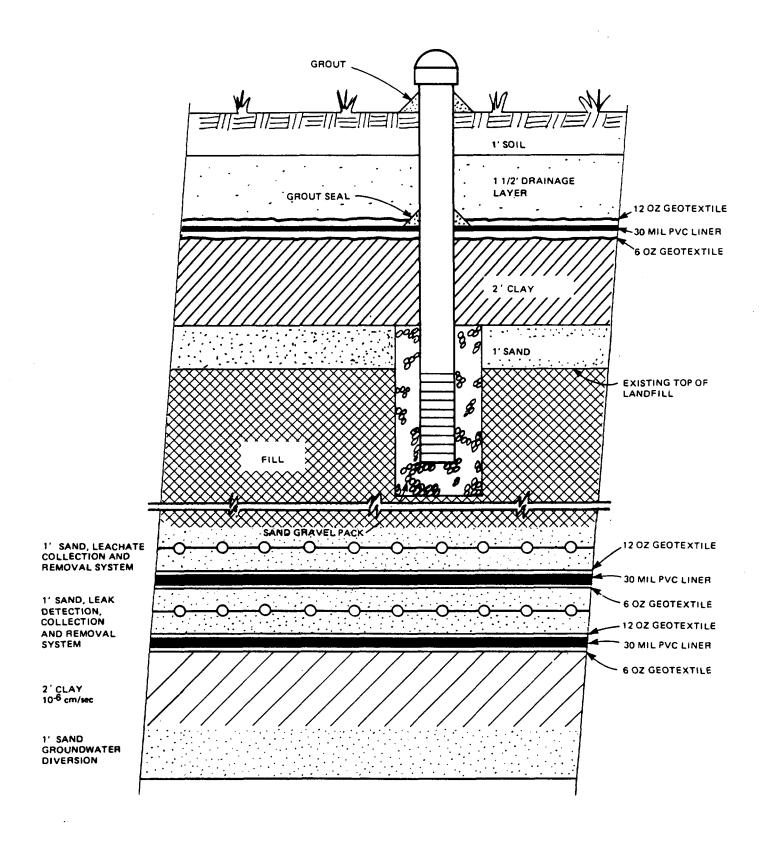


FIGURE 2-10
RCRA CAP AND GAS VENTING
SYSTEM AND BOTTOM LINER
ECC-NSL CAA

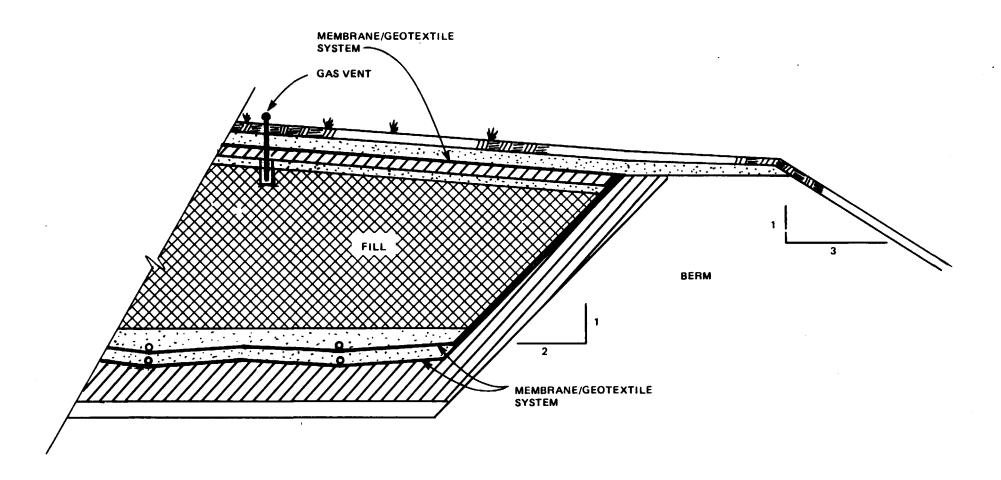


FIGURE 2-11
ONSITE RCRA LANDFILL
PARTIAL CROSS-SECTION
ECC-NSL CAA

part of the site could be an appropriate location for an onsite RCRA-type landfill.

Construction of the landfill would begin first followed by excavation of the existing landfill contents to prelandfilled ground surface. An additional 30 feet of soil in the saturated zone beneath the landfill on the southern half of the site was assumed to require excavation. ECC-contaminated soil was assumed to require excavation to elevation 865 feet or about 20 feet below ground surface. Excavation, placement, and construction would occur in a step-wise fashion to accommodate efficient work patterns. During excavation, the landfill contents would have to be sampled to determine their character. Highly contaminated wastes such as PCB's and reactive and low flashpoint substances cannot be stored in a RCRA landfill. They must be treated before disposal. Similarly, sludges and liquids may not be disposed of directly in a RCRA landfill, but must first be solidified or containerized. To establish a cost for this alternative, it was assumed that no treatment would be required for the materials to be placed in the RCRA landfill. Treatment of groundwater and dewatering liquids during construction of the RCRA landfill may be necessary but was not included in the cost of the alternative.

Operation and Maintenance

Operation and maintenance includes monitoring and repairs for the new landfill. The surface water and groundwater will be monitored to detect migration of residual contamination. Air quality will also be monitored. Maintenance will be required to maintain the integrity of the RCRA landfill. This will include erosion control; freeze-thaw repairs; mowing, grading, and reseeding the cap; and maintenance of access restrictions. Collection and disposal of leachate from the RCRA landfill should be minimal if the landfill is constructed correctly.

GLT655/9

Chapter 3 DETAILED ANALYSIS OF ALTERNATIVES

In accordance with Section 300.68(h) of the NCP, a detailed analysis of the alternatives, described in Chapter 2, is presented in this chapter. It includes technical, public health and welfare, environmental, institutional, and cost evaluations.

The detailed analysis presented is not intended to be all inclusive and encompassing, but it is intended to present sufficient information concerning each alternative to allow for a comparative evaluation. Additional information and considerations should be addressed during the detailed design of the selected alternative to better refine the implementation of the alternative. Numerous details will require additional evaluation and incorporation into the design if adequate safeguards are to be provided to allow for proper system performance and reliability.

TECHNICAL EVALUATION OF ALTERNATIVES

This section presents an evaluation of the technical aspects for each alternative. The technical evaluation involves assessing the ability, and generally to what degree, each alternative satisfies a given set of technical evaluation criteria.

TECHNICAL EVALUATION CRITERIA

Technical evaluation criteria described below were developed based on the EPA Feasibility Study Guidance document and reflect the NCP requirements for evaluation of engineering implementation, reliability, and constructibility.

- o Performance
 - Effectiveness to meet the remedial action goals
 - Useful life of components
- o Reliability
 - Demonstrated performance considering potential for poor performance or failure of system components and operational flexibility to address variations between design criteria and actual field conditions
 - Operation and maintenance requirements considering operation complexity, reliance on

monitoring results for reliable operation, and maintenance requirements and frequency

o Implementability

- Ease of installation and time of implementation
- Time required to achieve the remedial action goals

o Safety

- Risk to public health and the environment in the event of system failure
- Safety aspects during construction

TECHNICAL EVALUATION

The following discussion summarizes the more pertinent technical aspects of the alternatives. Table 3-1 presents a detailed listing of the technical evaluation criteria and the associated technical assessment for each alternative.

Elements Common To All Alternatives

Several elements are common to all the remedial action alternatives (with the exception of No Action). These primarily relate to the reliability of access restrictions in preventing exposure to onsite soil or onsite groundwater contamination. Since the contaminant source characteristics are largely unknown, the time period for the site contaminants to either be naturally degraded or removed through a groundwater collection system cannot be reliably estimated. As discussed in Chapter 1, it is possible, especially with the potential for buried drums onsite, that this period may well exceed 100 years. The reliability of deed restrictions in preventing future site development or use of groundwater beneath the site over this time period is not known.

Performance

All alternatives except No Action address the remedial action objectives relating to contaminated soil, leachate, and groundwater. Given proper implementation, operation, and maintenance of the alternatives, Alternatives 2 through 9 would be effective in reducing risks to public health and the environment from exposure via pathways associated with these media provided groundwater contaminant types and levels do not increase in the future. If levels or contaminant types do increase, Alternatives 2 and 3 would not be effective in reducing risks to the public health or environment since no groundwater controls are undertaken. Alternative 3, however, reduces

TECHNICAL EVALUATION CRITERIA

ALTERNATIVE 1 No Action

ALTERNATIVE 2 Access Restrictions With Soil Cover. Leachate Collection and Treatment

ALTERNATIVE 3 Access Restrictions With RCRA Cap. Leachate Collection and Treatment

ALTERNATIVE 4 Access Restrictions With Soil Cover, Leachate Collection, Groundwater Interception and Treatment

ALTERNATIVE 5 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Interception and Treatment

Performance

Effectiveness in Meeting Goals

Protection of public and environment from direct contact, inhalation, and ingestion of contam inants in NSL landfill contents, surface or subsurface soil on ECC and NSL, NSL leachate sediment, and sediment in the old creek beds of Finley Creek.

Potential exists for adverse health effects resulting from exposure to subsurface soil in landfill contents and leachate sediments and sediments in the old creek beds of Finley Creek. Soil cover at ECC may pose low level public health risk.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period.

Protection of public health and environment from direct contact, inhalation, and ingestion of contaminated leachate or its migration to surface waters and sediments at levels

posing risks.

Potential exists for adverse effects to public health and environment from future releases of contaminants in leachate.

Effective in protecting public health from direct contact with contaminants by eliminating surface leachate discharge. Leachate collection and soil cover eliminates discharges to surface water. Leachate can still migrate to groundwater.

Effective in protecting public health from direct contact with contaminants by eliminating surface leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent.

Effective in protecting public health from direct contact with contaminants by eliminating surface leachate discharge. Leachate collection and soil cover eliminates discharges to surface water. Leachate can still migrate to groundwater. Groundwater is subsequently collected and treated.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collections and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected and treated.

Protection of public health and the environment from direct consumption of contaminated groundwater or its migration to surface waters at levels posing risks.

effects from consumption of contaminated groundwater or fish that have bioconcentrated contaminants. Potential exists for adverse effects on public health and environment from future releases of contaminants to surface water.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Migration of contaminants to surface water is not eliminated. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement migration action may not be available before health or environment Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Migration of contaminants to surface water is not eliminated, although would be reduced relative to Alternative 2. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement mitigative action may not he available before health or environment are affected.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Useful Life of Components

With proper maintenance soil cover does not have a limit on useful life. Useful life of treatment facility is estimated at 30 years. Replacement

Useful life of RCRA cap is estimated at 30 years. Replacement is required. Useful life of treatment facility is estimated at 30 years. Replacement required.

With proper maintenance soil cover does not have a limit on useful life. Useful life of treatment facility is estimated at 30 years. Replacement required. Useful life of groundwater collection system is estimated at

Useful life of RCRA cap is estimated at 30 years. Replacement is required. Useful life of treatment facility is estimated at 30 years. Replacement required. Useful life of groundwater collection system is estimated at 50 years.

Reliability

Demonstrated Performance

Potential for poor performance or failure of system or components (assuming design assumptions are representative of actual site conditions).

Deed restrictions require maintenance for an indefinite time period. Potential exists that deed restrictions may not continue into the future.

Leachate collection with French drains is proven technology and is reliable.

Treatment processes are well demonstrated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

Deed restrictions require maintenance for an indefinite time period. Potential exists that deed restrictions may not continue into the future.

Long-term reliability of RCRA cap has not been demonstrated through is believed to be good given proper maintenance.

Leachate collection with French drains is proven technology and is reliable.

Deed restrictions require maintenance for an indefinite time period. Fotential exists that deed restrictions may not continue into the future.

Leachate and groundwater collection with French drains is a proven technology and is reliable.

Groundwater collection with extraction wells is proven technology and is reliable.

Treatment processes are well demonstrated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

Deed restrictions require maintenance for an indefinite time period. Potential exists that deed restrictions may not continue into the future.

Long-term reliability of RCRA cap has not been demonstrated though is believed to be good given proper maintenance.

Leachate and groundwater collection with French drains is a proven technology and is reliable.

Treatment processes are well demonstrated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

Demonstrated Performance (Continued)

Operational flexibility to address variations between design assumptions and actual site conditions.

Remediation of offsite groundwater or surface water contamination once it has been detected may require 1 year or more for implementation.

Treatment system has a high degree of flexibility to treat varying contaminant levels or types.

Remediation of offsite groundwater or surface water contamination once it has been detected may require 1 year or more for implementation.

Treatment system has a high degree of flexibility to treat varying contaminant levels or types.

Extraction wells may be pumped at varying rates to provide flexibility. French drains are passive and have some flexibility but little control.

Treatment system has a high degree of flexibility to treat varying contami-nant levels or types.

French drains are passive and have some flexibility but little control.

French drain groundwater interception system could be easily converted to isolation system if contaminant levels increase significantly in the future and long-term (>100 years) operation of collection system appears necessary.

Treatment system has a high degree of flexibility to treat varying contaminant levels or types.

Operation and Maintenance Requirements

Operational Complexity

Reliance on Monitoring

Operation is relatively simple and is not expected to effect the alternatives reliability.

Monitoring frequency and comprehensiveness are critical to successful implementation.

Operation is relatively simple and is ot expected to effect the alternatives reliability.

Monitoring frequency and comprehensiveness are critical to successful implementation.

Monitoring results are important to reliable operation of groundwater interception system.

Operation of groundwater interception

system introduces some complexity,

although it is not expected to sub-

stantially effect system reliability.

Operation of groundwater interception system introduces some complexity, although it is not expected to substantially effect system reliability.

Monitoring results are important to reliable operation of groundwater interception system.

> Maintenance requirements of cap are substantial because of potential landfill settlement. This reduces the reliability of the cap.

Maintenance Require ments and Frequency

Maintenance remuirements of can are substantial because of potential landfill settlement. This reduces the reliability of the cap.

> **TABLE 3-1 (Sheet 1 of 4) TECHNICAL EVALUATION OF ALTERNATIVES ECC-NSL CAA**

TECHNICAL EVALUATION CRITERIA

Performance

Effectiveness in Meeting Goals

Protection of public and environment from direct contact, inhalation, and ingestion of contaminants in NSL landfill contents. surface or subsurface soil on ECC and NSL. NSL leachate sediment, and sediment in the old creek beds of Finley Creek.

Protection of public health and environment from direct contact, inhalation, and ingestion of contaminated leachate or its migration to surface waters and sediments at levels posing risks.

Protection of public health and the environment from direct consumption of contaminated groundwater or its migration to surface waters at levels posing risks.

Useful Life of Components

Reliability

Demonstrated Performance

Potential for poor performance or failure of system or onents (assuming design assumptions are representative of actual site conditions).

Treatment processes are well demonstrated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

Demonstrated Performance (Continued)

Operational flexibility to address variations between design assumptions end actual site conditions.

Extraction wells may be pumped at varying rates to provide flexibility. French drains are passive and have some flexibility but little control.

of flexibility to treat varying contaminant levels or types.

ALTERNATIVE 7

Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction

ALTERNATIVE 6

Access Restrictions With RCRA Cap,

Leachate Collection, Groundwater

Isolation and Treatment

Effective in protecting public

health from direct contact with

Effective in protecting public

discharges to surface water.

trested.

onsite.

of contamination.

water or offsite.

Leachate can still migrate to

health from direct contact with

contaminants by eliminating surface

water leachate discharge. Leachate collections and RCRA cap eliminates

groundwater, but quantity is reduced

by an estimated 90 percent. Ground-

water is subsequently collected and

Effective in eliminating direct con-

sumption of groundwater given proper

implementation of deed restrictions

Groundwater isolation may eventually

eliminate risk to public health from direct consumption of groundwater by

lowering the water table below zone

Effective in preventing migration of

contaminated groundwater to surface

Useful life of RCRA cap is estimated

required. Useful life of treatment

facility is estimated at 30 years.

Useful life of groundwater collec-

50 years. Replacement required.

Deed restrictions require mainten-

ance for an indefinite time period.

Potential exists that deed restric-

tions may not continue into the

Long-term reliability of RCRA cap

believed to be good given proper

maintenance.

is reliable.

has not been demonstrated though is

Leachate and groundwater collection

with French drains is a proven tech-

Groundwater collection with extrac-

tion wells is proven technology and

immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Releases from leaking drums or

nology and is reliable.

at 30 years. Replacement is

rion system is estimated at

prohibiting installation of wells

implementation of deed restrictions

and maintenance of RCRA cap for an

contaminants given proper

indefinite period.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period.

Public health risk from future site excavation and direct contact, inhalation, and ingestion of VOC's in ECC contaminated soil is reduced to b cancer risk levels. ADI below 10 exceedance unchanged for lead and cadmium.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected

ECC soil vapor extraction greatly reduces generation of contaminated

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Useful life of RCRA cap is estimated st 30 years. Replacement is required. Useful life of treatment facility is estimated at 30 years. Replacement required. Useful life of groundwater collection system is estimated at

Deed restrictions require maintenance for an indefinite time period. Potential exists that deed restrictions may not continue into the

Long-term reliability of RCRA cap has not been demonstrated though is believed to be good given proper maintenance.

Leachate and groundwater collection with French drains is a proven technology and is reliable.

Groundwater collection with extraction wells is proven technology and is reliable.

Releases from leaking drums or immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Treatment processes are well demonstrated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

Soil vapor extraction has proven reliable under different site conditions. Pilot testing would be necessary.

Extraction wells may be pumped at varying rates to provide flexibility. French drains are passive and have some flexibility but little control.

Treatment system has a high degree of flexibility to treat varying contaminant levels or types.

Vapor extraction rates and number of wells can be easily alted d to address variations between dest / assumptions and field conditions.

ALTERNATIVE 8 Access Restrictions With RCRA Cap. Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period.

Public health risk from future site excavation and direct contact, inhalation, and ingestion of organic contaminants in soil reduced to below cancer risk levels. ADI exceedance unchanged for lead and cadmium.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected

ECC soil incineration greatly reduces generation of contaminated leachate

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Useful life of RCRA cap is estimated at 30 years. Replacement is required. Useful life of treatment facility is estimated at 30 years. Useful life of groundwater collection system is estimated at 50 years.

Deed restrictions require maintenance for an indefinite time period. Potential exists that deed restrictions may not continue into the

Long-term reliability of RCRA cap has not been demonstrated though is believed to be good given proper maintenance.

future.

Leachate and groundwater collection with French drains is a proven technology and is reliable

Groundwater collection with extraction wells is proven technology and is

immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater. Treatment processes are well demon-

Releases from leaking drums or

strated and reliable. Long-term reliability may diminish if system must be upgraded and maintained long past 30 years.

strated to be reliable in destroying organic contaminants.

Extraction wells may be pumped at varying rates to provide flexibility. French drains are passive and have some flexibility but little control.

reatment system has a high degree o flexibility to treat varying contaminant levels or types.

Incineration has good flexibility to changes in contaminant types or level. Feed rates and incineration temperatures can be varied to match needed conditions.

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period.

ALTERNATIVE 9

Access Restrictions With Onsite

RCRA Landfill

Effective in protecting public health from direct contact with contaminants by eliminating surface leachate discharge. If properly constructed, the onsite RCRA landfill would prevent leachate discharges.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Useful life of RCRA cap is estimated at 30 years. Replacement is required.

Deed restrictions require maintenance for an indefinite time period, Potential exists that deed restrictions may not continue into the future.

Long-term reliability of RCRA landfills has not been demonstrated though is believed to be good given proper maintenance.

The design of a RCRA landfill provides flexibility.

ALTERNATIVE 4 ALTERNATIVE 5 **TECHNICAL** Access Restrictions With Soil Cover, Leachate Collection, Groundwater Access Restrictions With RCRA Cap, **ALTERNATIVE 3 ALTERNATIVE 2 EVALUATION** Leachate Collection, Groundwater **ALTERNATIVE 1** Access Restrictions With Soil Cover, Access Restrictions With RCRA Cap. Interception and Treatment Interception and Treatment CRITERIA Leachate Collection and Treatment No Action Leachate Collection and Treatment Reliability (continued) Demonstrated Performance (Continued) Operational flexi-Remediation of offsite groundwater or Extraction wells may be pumped at French drains are passive and have Remediation of offsite groundwater or varying rates to provide flexibility. surface water contamination once it some flexibility but little control. surface water contamination once itbility to address has been detected may require 1 year has been detected may require 1 year French drains are passive and have some flexibility but little control. French drain groundwater interception or more for implementation. or more for implementation. design assumptions and actual site system could be easily converted to isolation system if contaminant levels Treatment system has a high degree of Treatment system has a high degree of conditions. Treatment system has a high degree of flexibility to treat varying contamiflexibility to treat varying flexibility to treat varying contamiincrease significantly in the future and long-term (>100 years) operation contaminant levels or types. nant levels or types. nant levels or types. of collection system appears necessary. Treatment system has a high degree of flexibility to treat varying contaminant levels or types. Operation and Maintenance Requirements Operation is relatively simple and is Operation is relatively simple and is Operation of groundwater interception Operation of groundwater interception Operational Complexity system introduces some complexity, not expected to effect the alternasystem introduces some complexity, not expected to effect the alternatives reliability. tives reliability. although it is not expected to subalthough it is not expected to substantially effect system reliability. stantially effect system reliability. Monitoring results are important to Reliance on Monitoring Monitoring frequency and comprehen-Monitoring frequency and comprehenreliable operation of groundwater siveness are critical to successful siveness are critical to successful Monitoring results are important to implementation. reliable operation of groundwater implementation. interception system. interception system. Maintenance Require-Maintenance requirements of cap are Maintenance requirements of cap are substantial because of potential landsubstantial because of potential ments and Frequency fill settlement. This reduces the reliability of the cap. landfill settlement. This reduces the reliability of the cap. <u>Implementability</u> Implementation of RCRA cap requires Implementation of RCRA cap requires Installation of soil cover is Ease of Installation and Installation of soil cover is extensive extensive but relatively simple. Time to Implement but relatively simple. careful installation of each media, careful installation of each media, especially the impermeable membrane especially the impermeable membrane. Estimated time of design and construc-Time to Achieve Remedial Action Goals tion is 6 months to 1 year. construction is 1 to 2 years. construction is 1 year. construction is 1 to 2 years. Estimated 5 years to achieve lowering of water table beneath site. <u>Safety</u> The failure of the monitoring program The failure of the monitoring program Risk to public health If access restrictions are not main-If access restrictions are not mainto detect groundwater or surface water and environment in to detect groundwater or surface tained in the future, site excavation tained in the future, site excavation the event of system contamination could result in adverse water contamination could result in or development could result in subor development could result in subfailure. health effects on the public and adverse health effects on the public stantial risks to public health and stantial risks to public health and adverse effects on the aquatic life. and adverse effects on the aquatic If access restrictions are not main-If access restrictions are not main-Failure of groundwater interception Failure of groundwater interception tained in the future, site excavation tained in the future, site excavation system would likely be detected before system would likely be detected before or development could result in subsignificant risk to public health or or development could result in significant risk to public health or substantial risks to public health stantial risks to public health and environment occurs. environment occurs. and the environment. the environment. Failure of treatment system not likely Failure of cap would increase reli-Failure of treatment system not likely Failure of treatment system not likely

Safety During Construction

Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system and soil cover.

to pose risk to public health or the

environment over the short-term at

present contaminant levels.

Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system and cap.

ance on monitoring for protection of

public health and environment.

Failure of treatment system not likely to pose risk to public health

or the environment over the short-

term at present contaminant levels.

Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system, soil cover and groundwater collection system.

to pose risk to public health or the

environment over the short-term at

Treatment systems has 2-day holding

failure. If leachate or groundwater

contaminant levels increase in future.

capacity for leachate in event of

additional onsite storage volume

should be considered.

present contaminant levels.

Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system, cap, and groundwater collection system.

to pose risk to public health or the

environment over the short-term at

Treatment system has 2-day holding

capacity for leachate in event of

future, additional onsite storage volume should be considered.

contaminant levels increase in

failure. If leachate or groundwater

present contaminant levels.

TECHNICAL EVALUATION CRITERIA	ALTERNATIVE 6 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment	ALTERNATIVE 7 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction	ALTERNATIVE 8 Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration	ALTERNATIVE 9 Access Restrictions With Onsite RCRA Landfill
Reliability (continued) Operation and Maintenance				
Requirements Operational Complexity	Groundwater isolation system is operationally more complex than groundwater interception and system reliability to perform as designed is less.	Groundwater isolation system is opera- tionally more complex than groundwater interception and system reliability to perform as designed is less.	Croundwater isolation system is oper- ationally more complex than ground- water interception and system reliability to perform as designed is less.	Operation is relatively simple and is not expected to effect the alterna- tive's reliability.
Reliance on Monitoring	Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.	Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.	Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.	Monitoring is essential to check the integrity of the landfill liner.
Maintenance Require- ments and Frequency	Maintenance requirements of cap are substantial because of potential landfill settlement. This reduces the reliability of the cap.	Maintenance requirements of cap are substantial because of potential land- fill settlement. This reduces the reliability of the cap.	Maintenance requirements of cap are substantial because of potential landfill settlement. This reduces the reliability of the cap.	Maintenance requirements of RCRA landfill are substantial because of potential for settlement. This reduces the reliability of the cap and liner.
			Operation of soil incinerator is com- plex and would require full-time trained operator. Partial replace- ment of refractory is common mainten- ance requirement.	
Implementability				
Ease of Installation and Time to Implement	Implementation of RCRA cap requires careful installation of each media, especially the impermeable membrane.	Implementation of RCRA cap requires careful installation of each media, especially the impermeable membrane.	Implementation of RCRA cap requires careful installation of each media, especially the impermeable membrane.	Implementation of RCRA landfill is extensive and requires careful installation of the cap and liner.
Time to Achieve Remedial Action Goals	Estimated time of design and construction is 1 to 2 years.	Installation of cap over ECC would follow the 2 to 4 year operation period of soil vapor extraction. Total estimated time of design and construction is 3 to 6 years.	Installation of cap over ECC would follow the 3 to 4 years implementation period of ECC soil incineration. Total estimated time of design and construction is 4 to 6 years.	Estimated time of design and construction is 3 to 5 years.
	Estimated 5 years to achieve lowering of water table beneath site.	Estimated 5 years to achieve lowering of water table beneath site.	Estimated 5 years to achieve lowering of water table beneath site.	
<u>Safety</u>				
Risk to public health and environment in the event of system failure.	If access restrictions are not maintained in the future, site excavation or development could result in substantial risks to public health and the environment.	If access restrictions are not maintained in the future, site excavation or development could result in substantial risks to public health and the environment.	If access restrictions are not maintained in the future, site excavation or development could result in substantial risks to public health and the environment.	Failure of RCRA landfill would lead to release of contaminants and may effect public health and the environment. Remediation after detection of failure could likely be implemented before significant risk to public health or the environment occurred.
	Failure of groundwater collection system would likely be detected before significant risk to public health or environment occurs.	Failure of groundwater collection system would likely be detected before significant risk to public health or environment occurs.	Failure of groundwater collection system would likely be detected before significant risk to public health or environment occurs.	If access restrictions are not maintsined in the future, site excavation or development could result in substantial risks to public health and the environment.
. "	Groundwater isolation system provides additional time for remediation after failure detection.	Groundwater isolation system provides additional time for remediation after failure detection.	Groundwater isolation system provides additional time for remediation after failure detection.	e de la companya de
	Failure of treatment system not likely to pose risk to public health or the environment over the short- term at present contaminant levels.	Failure of treatment system not likely to pose risk to public health or the environment over the short-term at present contaminant levels.	Failure of treatment system not likely to pose risk to public health or the environment over the short term at present contaminant levels.	
	Treatment system has 2-day holding capacity for leachate in event of failure. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.	Treatment system has 2-day holding capacity for leachate in event of failure. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.	Treatment system has 2-day holding capacity for leachate in event of failure. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.	
Safety During Construction	Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system, cap, and groundwater collection system.	Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system, cap, and groundwater collection system.	Potential exposure of construction workers to hazardous levels of contaminants during construction of leachate collection system, cap, and groundwater collection system.	Potential for exposure of construction workers during excavation is very high.
		Air emissions during soil vapor extraction system are not believed to pose risk to operator.	Contact with contaminated soil and high temperatures of rotary kiln are operational safety concerns.	

the possibility of increasing contaminant levels by greatly reducing leachate generation.

Alternatives 4 through 8 would be effective in the case of increasing contaminant types or levels in the future. Alternative 4 allows leaching of soil and landfill contaminants in the unsaturated zone to the groundwater with their subsequent collection and treatment. Though in some cases this can be used as a means of contaminant removal from soils, at ECC and NSL it would not be very effective. This is because many contaminants have very long travel times between the contaminant source and the collection system, possibly in excess of 100 years. The collection and treatment system of Alternative 4 may require operation indefinitely.

Alternative 5 includes a RCRA cap to greatly reduce contaminant migration from the unsaturated zone to the groundwater. This will reduce the treatment necessary for the collected groundwater and leachate and would likely result in a shorter operational period of the collection and treatment system for groundwater. Alternatives 6, 7, and 8 include the groundwater isolation system in addition to the RCRA cap. The object of the system is to prevent further contamination of the groundwater and eventually (in 5 to 15 years) result in treatment of leachate only.

Alternatives 7 and 8 do not rely as heavily as other alternatives on performance of deed restrictions for preventing ECC site excavation and exposure to contaminants in soil. The soil vapor extraction of Alternative 7 would remove the majority of soil contaminants posing public health risks from direct contact, inhalation, or ingestion. The soil incineration of Alternative 8 results in destruction of all organic contaminants in soils with contaminants above the 10 cancer risk level. Alternative 9 would be the most effective in addressing all the remedial action goals since all contaminants are isolated from environmental media.

Reliability

Alternatives differ in their reliability to perform effectively (especially in the long-term where contaminant levels and types may increase). Alternatives 2 and 3 place a heavy reliance on monitoring to detect increases in contaminant levels or types. The average travel time of groundwater contaminants between detection and discharge to the surface waters is estimated to be about 8 months in the till and will be shorter for contaminants moving through lenses of sand and gravel. This may not be sufficient time for implementation of the necessary remedial actions to collect contaminated groundwater before it reaches Finley Creek.

The long-term reliability of the RCRA cap of Alternatives 3, 5, 6, 7, 8, and 9 to continue performing effectively has not been demonstrated, though it is believed to be good if regular maintenance is performed. The reliability of groundwater collection systems is good although the groundwater isolation system of Alternatives 6, 7, and 8 is more complex and thus may be less reliable than the interception systems of Alternatives 4 and 5 to perform as designed. The reliability of the isolation system in protection of public health and environment, however, is greater than the interception systems since they provide much longer times between collection system failure and release of groundwater contaminants to surface water. The groundwater and leachate treatment systems have a high degree of flexibility to treat varying contaminant types and levels and are considered reliable.

The reliability of the soil vapor extraction of Alternative 6 is difficult to assess until pilot testing at ECC is performed, although it has proved reliable at other sites. The soil incineration of Alternative 7 is considered reliable in destroying organic contaminants. The long-term reliability of the RCRA landfill of Alternative 8 is difficult to assess since RCRA landfills do not yet have a long operational history. However, given substantial maintenance and replacement costs, the reliability of Alternative 8 is believed to be good.

Implementability

Implementation of each of the alternatives (except No Action) will require extensive construction because the NSL site is so large. Alternative 2 will be the easiest to implement since it has the fewest components to construct. Installation of a groundwater interception system makes Alternatives 4 and 5 more difficult to implement than Alternative 2. Alternatives 3, 5, 6, 7, and 8 require additional construction time and expertise for the RCRA cap. Alternatives 6, 7, and 8 will be more difficult to construct than Alternative 3 because of the installation of a groundwater isolation system.

Alternative 7 requires 2 to 4 years for operation of the soil vapor extraction system. The RCR\ cap would not be placed over ECC until operation was complete. Incineration of ECC soil in Alternative 8 requires an additional 3 to 4 years before construction of the cap.

Alternative 9 will be the most difficult to implement because of the difficulty and time involved in excavating the existing landfill and constructing a RCRA-type landfill onsite.

Safety

The risk to public health and environment in the event of a system failure is largely related to the time available between detection of the system failure and implementation of corrective action. Failure of the monitoring program of any of the alternatives to detect offsite contaminant migration could result in adverse health or environmental effects. Failure of the groundwater collection or treatment systems of Alternatives 4, 5, 6, 7, and 8 would likely be detected before significant adverse effects occur. In the event of treatment system failure, untreated leachate would be stored in a holding tank until the system becomes operational. The groundwater collection systems could be shut down until the treatment system was operational since contaminated groundwater would not have sufficient time to migrate beyond the collection area.

If a collection system failure were not detected the ground-water isolation system of Alternatives 6, 7, and 8 would allow much greater time before adverse effects could occur since it would take additional time for the water table to rise into the zone of contaminated soil at ECC or NSL. Remediation could also likely be undertaken in Alternative 9 before adverse health or environmental effects occur because of a release from the RCRA landfill. The potential for exposures of construction workers is a major concern for the excavation of the NSL landfill in Alternative 9.

INSTITUTIONAL/PUBLIC HEALTH/ENVIRONMENTAL ANALYSIS

In the detailed evaluation and final selection of a remedial action alternative, adequate protection of public health, welfare, and the environment is a major concern. The National Contingency Plan requires for each alternative:

- (D) An assessment of the extent to which the alternative is expected to effectively mitigate, or minimize threats to, and provide adequate protection of, public health, welfare, and the environment [40 CFR 300.68(h)(2)(iv)].
- (E) An analysis of any adverse environmental impacts, methods for mitigating these impacts, and costs of mitigation [40 CFR 300.68(h)(2)(vi)].

In this section, each alternative undergoing detailed analysis is evaluated with regard to its impact on institutional, environmental, and public health concerns. This analysis evaluates short-term (construction-related) impacts, those impacts related to the operation of the remedial technology, and the final results of the remedial action alternative.

The institutional analysis examines the ability of each alternative to attain federal, state, and local environmental and

public health standards, regulations, guidance, advisories, and ordinances. Included in this analysis is a consideration of land use and zoning.

The public health analysis considers a broad range of public health and welfare concerns. Criteria used in evaluating the impact on public health and welfare are: public health risks; odor, noise, air and water pollution impacts; disruption and dislocation of households, businesses, and services; aesthetics; impact on prime farmland, parks, and recreation; impact on traffic.

The environmental analysis evaluates such impacts as wildlife habitat alteration; water pollution; toxic and adverse effects on plants and wildlife; impacts on threatened and endangered species; natural resource loss and diminution; and impacts on wetlands and unique resources.

INSTITUTIONAL ISSUES

This section discusses federal, state, and local environmental and public health laws, regulations, and policies that may affect the implementation of remedial action alternatives. As a general rule, it is EPA's policy that in CERCLA remedial actions, "applicable or relevant and appropriate Federal" public health and environmental requirements must be complied with.

Applicable laws and standards are those that would be specifically triggered when the law or regulation is clearly and indisputably the controlling authority for the planned action for the proposed Superfund remedy except that the proposed action would be undertaken pursuant to CERCLA Section 104 or 106; e.g., applicable laws and standards are those that would legally apply if the action was not being taken under the authority of CERCLA. Relevant and appropriate laws or standards are those where the intent of the law or standard is to apply to circumstances sufficiently similar to those encountered at CERCLA sites. The term "relevant and appropriate" means that the law or regulation need not be truly applicable or legally required to the proposed action or existing circumstances but that the intent of the law was to control similar situations.

EPA does not require permits for onsite fund-financed or enforcement actions taken under CERCLA. Certain permits are, however, required for offsite actions involving treatment, storage, or disposal beyond the site boundaries. Examples are wastewater discharges and disposal of hazardous wastes.

Federal, state and local laws, regulations, and policies are reviewed for applicability to the remedial action alternatives in this study. Applicable requirements considered

important "institutional" issues in comparing remedial action alternatives are reviewed in more detail in the following discussion. These issues include hazardous waste management, wastewater discharges, and contaminant emissions to the atmosphere.

Coordination with Other Agencies

The NCP states in 40 CFR300.22 that federal agencies should coordinate their planning and response activities through mechanisms outlined in Subpart C of the NCP. The duty to manage certain aspects of CERCLA responses has been delegated to several federal agencies. Those federal agencies that may have responsibilities in the CERCLA response to the ECC and NSL sites are listed in Table 3-2.

Compliance with Environmental Statutes

Not all federal environmental laws and regulations are applicable to each CERCLA response action. For the combined alternatives developed for the ECC and NSL sites, several federal environmental laws and regulations are not applicable. These laws and regulations, along with the reasons for their nonapplicability, are set out in Table 3-3. Alternatives and relevant laws are shown in Table 3-4.

Summary of Institutional Issues

This analysis addresses the impacts of each alternative on the basis of interplay between implementation of the alternative and institutional constraints. Criteria used in evaluating the institutional impacts are political jurisdictions; relevant and applicable federal and state standards; need for land acquisition; changes in land use and zoning; local/state/federal laws or policies; and need for permits and permit-like restrictions. These impacts are summarized in Table 3-5.

GENERAL PUBLIC HEALTH CONCERNS

The public health risk assessment of the No Action alternative highlighted two major exposure concerns. They include exposure to contaminants in subsurface soil and leachate sediment primarily through direct contact/ingestion and exposure to contaminants in groundwater as a result of potable water use of the aquifer. Each alternative is specifically evaluated for its impact on mitigating these potential exposures.

Table 3-2 FEDERAL AGENCY COORDINATION

Agency	Comments
Federal Emergency Management Agency (FEMA)	No alternative requires relocation of a business operation.
Dept. of Health & Human Services (HHS)	All alternatives that involve action will be preceded by a contact with HHS to request the appropriate support.
U.S. Army Corps of Engineers (COE)	All alternatives that involve fund financed action may be managed by the COE. COE may be contacted when EPA has selected a remedial action and is prepared to proceed.
Dept. of Labor Occupational Safety and Health Admin- istration (OSHA)	All alternatives that involve onsite action may require OSHA contact before action to provide input and assistance if necessary.
Department of Trans- portation (DOT)	All alternatives that require offsite transportation of contaminated media will comply with DOT regulations regarding the transportation of hazardous materials.
U.S. Fish and Wild- life Service (USFWS)	Some game species and fish may be affected if the access restriction or No Action alternative is implemented.
Bureau of Land Man- agement (BLM)	No federal lands are involved in the implementation of alternatives.
Advisory Council on Historic Preservation	No landmarks, historic sites, or areas of historic, scientific, or cultural interest will be affected by the implementation of alternatives.
U.S. Forest Service (USFS) ^a	No wild and scenic rivers will be affected by implementation of alternatives.
Department of Housing and Urban Development (HUD)	Portions of the NSL site lie in a flood plain; therefore, HUI flood plain maps will be required for the site.

 $^{^{\}mathbf{a}}$ Coordination with this agency not anticipated to be needed at this site.

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Table 3-3

FEDERAL ENVIRONMENTAL LAWS, REGULATIONS, POLICIES, AND STANDARDS REVIEWED AND FOUND NOT APPLICABLE TO ALTERNATIVES

Law, Regulation or Policy	Applicability
Safe Drinking Water Act, Underground Injection Control (UIC) Program: Criteria and Standards (40 CFR Part 146)	None of the alternatives includes the underground injection of any materials.
40 CFR 403 Effluent Guidelines and Standards Pretreatment Standards	None of the alternatives includes discharge of effluent to POTW.
Marine Protection, Research and Sanctuaries Act (40 CFR Part 220-229) Ocean Dumping Requirements	Implementation of the alternatives does not include the dumping of any materials in the ocean or incineration at sea.
Radioactive Waste RuleHigh and Low Level	Existing records do not indicate that the site contains high- or low-level radioactive waste.
National Register of Historic Places	Implementation of the alternatives should not affect sites on the register.
Wild and Scenic Rivers Act (40 CFR Part 6.302)	Rivers on the national inventory will not be affected by alternatives.
Endangered Species Act Protection of Threatened or Endangered Species and Their Habitats (50 CFR Part 402)	Implementation of the alternatives should not affect threatened or endangered species and their habitat.
Fish and Wildlife Act Conservation of Wildlife Resources	Implementation of the alternatives should not affect areas of important wildlife resources.
Coastal Zone Management Act (15 CFR 920-926)	Implementation of the alternatives will not affect a coastal zone.
National Environmental Policy Act (NEPA)	CERCLA actions are exempted from the NEPA requirement because EPA's decision-making process in selecting a remedial action alternative is the functional equivalent of the NEPA analysis.
Archaeological and Historic Preservation Act of 1974	No such resources are expected to be affected by the alternatives.

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Table 3-4 (Page 1 of 4) ALTERNATIVES COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

		Alternative										
Law or Regulation	Analysis	1	2	_3_	4	_5_	6	7	8	9		
FEDERAL Resource Conservation and												
Recovery (RCRA) - Subtitle C												
40 CFR 264-265 Standards for owners and operators of hazardous waste treatment,	This alternative may not be consistent with current RCRA regulations.	X	x									
storage and disposal facilities.	This alternative will require use of an RCRA-type facility meeting the technical requirements of current RCRA Subtitle C requirements.									Х		
Clean Air Act (CAA)	Implementation of this alternative may result in the emission of pollutants into the air though below regulatory limits. A permit may not be required, but any necessary technical requirements will be met.			X	x	х	X	х	X	x		
	Onsite excavation will result in the short-term emission of particulates. Onsite personnel will be adequately protected. Efforts to mitigate release will be made.								x	х		
Clean Water Act (CWA)												
40 CFR Parts 122, 125 and Subpart N National Pollutant Discharge Elimination System (NPDES)	Indiana has authorization to administer NPDES in Indiana. Refer to section on state regulation.											

Table 3-4 continued (2 of 4)

		Alternative									
Law or Regulation	Analysis	1	2	_3_	4	_5_	6	7	_8_	9	
DOT Hazardous Materials Transport Rules (49 CFR Subchapter C) and RCRA Subtitle C Standards for Transporters 40 CFR 263	Implementation of this alternative includes the offsite transport of contaminated water from dewatering of cooling pond or contaminated treatment system sludge. The transport of these materials will be in compliance with these rules, including use of properly constructed and marked transport vehicles, use of a licensed transporter and use of a hazardous waste manifest.		x	x	x	х	x	x	x		
Federal Water Quality Criteria (FWQC)	Implementation of this alternative may not result in compliance with FWQC in surface water.	х	x	X							
EPA Groundwater Protection Strategy	This alternative may not attain EPA's groundwater protection strategy goals for a class II aquifer.	X	x	x							
Occupational Safety & Health Act (OSHA) Part 1910 (OSHA Standards)	Implementation of this alternative will require work on the site. Working conditions must assure safety and health of workers.		х	x	х	X	x	х	х	Х	
Toxic Substances Control Act (TSCA) 40 CFR 761	Alternative may require disposal of PCB-contaminated material; however, PCB levels may not be at concentrations triggering disposal requirements. Material cannot be spread along roadways.								x	x	
Intergovernmental Review of Federal Programs 40 CFR 29	Alternative may require intergovernmental review of project since project may use federal funds.		X	x	x	х	х	X	x	х	

Table 3-4 continued (3 of 4)

		Alternative									
Law or Regulation	Analysis	1	2	_3_	4	_5_	6	7	8	9	
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1979 (40 CFR 4)	Implementation of the alternatives should not require relocation of residences or businesses but may require acquisition of property.		х	x	х	x	x	х	x	x	
Executive Orders for Flood Plain (E011988)	Implementation of this alternative will affect flood plains.		x	X	X	X	X	x	X	x	
Executive Orders for Wet- lands (E011990)	Implementation of this alternative will affect some wetland area.		x	x	x	x	x	X	X	x	
STATE Indiana Hazardous Waste Management Program - Indiana Environmental Management Board Article 4 (320-1AC-4)											
Rules, 2, 3, and 4 Water Generation Identification, Standards for Generators	This alternative will involve offsite disposal of hazardous waste and generator regulations apply.		x	x	Х	x	x	X	x		
Rule 6 Standards Applicable to Owners and Operators of Hazardous Waste Facilities	This alternative may not be consistent with current state regulations.	х	x	x							
Rule 7 Closure/Postclosure	This alternative may be consistent with current state regulations although no permit will be required.				х	X	х	x	x	X	
Rule 8-9 Hazardous Waste Facility Construction and Operating Permit	This alternative will require the use of a state-permitted facility in compliance with current state regulations.		x	x	X	x	x	x	x	. X	

Table 3-4 continued (4 of 4)

				_	A1t	ernativ	re			
Law or Regulation	Analysis	1	2	3	4	_5_	6	_7_	8	9
Indiana Waste Treatment Facilities Regulation - Title 330 - Article 3.1 Facility Construction	This alternative will require construction of a waste treatment facility and will be consistent with the technical requirement of Article 3.1.		х	х	X	х	x	X	X	X
Article 5 Industrial Wasterwater Pretreatment and NPDES Programs - Rules 1 - 10	Implementation of this alternative may result in an onsite point source discharge. An NPDES permit will be required.		X	х	x	X	х	х	х	x
Rules 11-15 Pretreatment Standards	Not applicable. Implementation of this alternative may not result in discharge of a waste stream to a publicly-owned treatment works (POTW).	X	X	x	X	Х	х	х	х	х
Indiana Water Quality Standards Stream Pollution Control Board 330 (AC Article 1-2, Section 6 Water Quality Standard	Implementation of this alternative may not result in compliance with Indiana Water Quality Standards	x	X	X						
Indiana Air Pollution Control	This alternative may be consistent with the technical requirement of current Indiana regulation although no permit will be required.		X	х	х	x	Х	x	х	x
Indiana Department of Natural Resources	This alternative will require a permit to construct in floodways.		X	X	X	X	X	x	X	X
LOCAL Zoning	This alternative may require zoning change.	x	x	x	X	x	x	x	x	x

Table 3-5 (Page 1 of 2) SUMMARY OF INSTITUTIONAL IMPACTS OF ALTERNATIVES

Alternative	Comment
1No Action	Uncontrolled hazardous waste site does not meet goals of CERCLA. Groundwater in violation of drinking water quality criteria. Surface water exceeds ambient water quality criteria for protection of human health.
2Access Restrictions, with Soil Cover, Leachate Collection and Treatment	Contaminants not removed. Potential future direct contact and incompatible use eliminated. Water quality criteria may be violated. May need to acquire land and implement deed restrictions. The potential for releases of contaminanted groundwater from the site continues, so policy goal of CERCLA may not be met. Alternative must be implemented to minimize impact on flood plain and wetland areas.
3Access Restrictions with RCRA Cap, Leachate Collection and Treatment	Contaminants not removed. Potential for future direct contact and compatible use eliminated. Alternative must be implemented to minimize impact on flood plain and wetland areas. Water quality criteria may be violated. May need to acquire land and implement deed restriction. The potential for releases of contaminated groundwater from the site continues, so policy goal of CERCLA may not be met.
4Access Restrictions with Soil Cover, Leachate Collection, and Groundwater Interception and Treatment	Contaminants not removed. The CERCLA goal of protection of public health, welfare, and environment is achieved. Alternative must be implemented to minimize impact on flood plain and wetland areas.
5Access Restrictions with RCRA Cap, Leachate Collection and Groundwater Interception and Treatment.	Contaminants not removed. The CERCLA goal of protection of public health, welfare, and the environment is achieved. All standards will be met. Alternatives must be implemented to minimize impact on flood plain and wetland area.
6Access Restrictions with RCRA Cap, Leachate Collection, and Groundwater Isolation and Treatment	Contaminants not removed. Isolation of contaminants from groundwater. All standards will be met. CERCLA goal of protection of public health, welfare, and environment is achieved. Alternative must be implemented to minimize impact on flood plain and wetland areas.

Majority of ECC soil contaminants removed. Isolation of

contaminants from groundwater. All standards will be

7--Access Restrictions with RCRA Cap, Leachate Collection, and Groundwater Isolation and Treatment and ECC Soil Vapor Extraction

8--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

9--Access Restrictions with Onsite RCRA Landfill

met. CERCLA goals will be met. Alternative must be implemented to minimize impact on flood plain and wetland areas.

Majority of ECC soil contaminants destroyed. Isolation of contaminants from groundwater. All standards will be

met. CERCIA goals will be met. Requires delisting of residue to dispose of it onsite. No permits required but need to follow technical requirements. Alternative must be implemented to minimize impact on flood plain and wetland areas.

Contaminants isolated. All standards will be met. Waste is secured in a more reliable facility. CERCLA goals will be met. Alternative must be implemented to minimize impact on flood plain and wetland areas.

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PUBLIC HEALTH/ENVIRONMENTAL ASSESSMENT OF ALTERNATIVES

Alternative 1--No Action

Existing and potential future endangerment to public health, welfare, and the environment would not be mitigated. Access to the site would not be restricted and people could come into direct contact with contaminants in the soil and sediment. Contaminants have the potential to release from the fill to the surface water via leachate or groundwater.

Because the nature of the contaminants in the fill is not known, it is not possible to predict the nature of contaminant releases. Consequently, future impacts cannot be addressed in terms of exceeding numerical public health and environmental criteria. However, because a potentially complete groundwater exposure pathway will exist under this alternative, there is a concern for potential adverse public health and environmental impacts if future releases of contaminants should occur. The adjacent surface waters would be vulnerable to future releases of contaminants from groundwater and leachate discharges. The potential adverse health and environmental effects of No Action were presented earlier in Tables 2-1 and 2-2.

Alternative 2--Access Restrictions with Soil Cover and Leachate Collection and Treatment

Access restrictions, sediment reconsolidation, stream relocation, leachate collection and treatment, fencing, monitoring, and a soil cover would greatly reduce the potential for exposures from direct contact with contaminated soil and sediment as well as minimize environmental impacts that could result from contact of wildlife with site contaminants. There would be no restrictions, however, on the potential release of contaminants to the groundwater and, as discussed in the No Action alternative, this could result in public health and environmental impacts. Releases of contaminants to groundwater and surface waters could continue for over 100 years. The aesthetics of the landfill would be improved by placement of a vegetated cover.

There may be minor dust releases and noise during sediment excavation and reconsolidation, grading of site, and application of soil cover. Short-term adverse construction effects on aquatic habitat may occur because of stream relocation.

Difficulties may be encountered in implementing and enforcing institutional and access controls for periods in excess of 100 years. For example, the effectiveness of land use and groundwater use restrictions for long-term actions has not been established. Failure of use restrictions could result

in exposure to contaminants at some future time. This alternative may require zoning changes and it would be necessary to institute use restrictions on the deed.

Alternative 3--Access Restrictions with RCRA Cap and Leachate Collection and Treatment

The public health and environmental impacts are similar to Alternative 2. Potential environmental impacts from the discharge of contaminated groundwater to the surface water remains unabated under this alternative, potentially resulting in a diminution of the natural resources. Capping the sites, however, will reduce leachate and lessen the possibility of increasing groundwater and surface water contaminant levels in the future. Releases to the groundwater and surface water would still be expected for over 100 years.

The short-term impacts of applying the RCRA cap are from noise, dust generation, and traffic. Noise and dust would be generated by truck traffic in and out of the landfill as well as heavy construction equipment working onsite. Residents, however, currently experience such nuisances from garbage trucks and onsite equipment during normal landfill operation. As in Alternative 2, the difficulties in implementing access restrictions for periods in excess of 100 years are a concern.

Alternative 4--Access Restrictions with Soil Cover, Leachate Collection, Groundwater Interception, and Treatment

Alternative 4 mitigates public health and environmental impacts of the NSL site. The alternative is similar to Alternatives 2 and 3 with regard to preventing human contact with contaminants in the soil and sediment, but it also prevents releases to the surface waters. Groundwater interception precludes the release of contaminants to the surface water, eliminating the exposure pathway to the natural environment and downstream surface water users. Aquatic habitat in Finley Creek may improve over time as a result of cessation of discharges.

Short-term construction impacts such as noise, dust, and traffic disruption would be similar to Alternative 2 with the exception of some small increases in disturbances from the installation of the groundwater interception system.

Alternative 5--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Interception and Treatment

Public health and environmental impacts of Alternative 5 are similar to Alternative 4. The presence of the RCRA cap will greatly reduce the leaching of contaminants from contaminated soils to the groundwater and may result in a shorter period over which onsite groundwater exceeds drinking water standards.

Construction impacts would be similar to those discussed in Alternative 3 and 4.

Alternative 6--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Isolation, and Treatment

Public health and environmental impacts of Alternative 6 are essentially the same as Alternative 5. The lowering of the water table below the zone of soil contamination will likely reduce groundwater contamination beneath the sites to levels below water quality criteria and standards. This may occur within 5 years of implementation.

Construction impacts would be similar to those discussed in Alternative 3, except the installation of the groundwater isolation system would cause small increases in noise and dust generation.

Alternative 7--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction

The public health and environmental impacts of Alternative 7 would be approximately the same as the impacts of Alternative 6, except that the ECC soil vapor extraction system would reduce the generation of contaminated leachate and reduce public health risks in the event of future site excavation.

Alternative 8--Access Restrictions with RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

The public health and environmental impacts of Alternative 8 would be similar to Alternative 6, except that ECC soil incineration would reduce the generation of contaminated leachate at ECC and reduce public health risks in the event of future site excavation. Alternative 8 reduces risks associated with direct contact, inhalation, and ingestion of all organic contaminants as opposed to VOC's only in Alternative 7. Short-term impacts may occur from release of contaminants to air or surface water during the ECC site excavation.

Alternative 9--Access Restrictions with Onsite RCRA Landfill

This alternative is the most protective of the public health, welfare, and the environment. The contaminants in the existing fill would be secured in a facility of known design and construction with redundant monitoring systems to forewarn of impending releases. This alternative has the greatest short-term impacts of all the alternatives. Excavation of the landfill could release volatiles and contaminated dust. The period of construction would also be longer for this alter-

native than for any of the previous alternatives. Import of materials for liner construction could severely disrupt traffic patterns as well as increase noise and dust generation.

COST ANALYSIS

GENERAL DISCUSSION

Cost estimates for the alternatives were prepared from cost information included in the U.S. EPA's "Compendium of Costs of Remedial Technologies at Hazardous Waste Sites," the 1985 Means Site Work Cost Data guide, Cost Reference Guide for Construction Equipment 1985, estimates for similar projects, and estimates provided by equipment vendors.

Capital and operation and maintenance cost estimates are order-of-magnitude level estimates, that is, the cost estimates have an expected accuracy of +50 and -30 percent. The estimated present worth of remedial alternatives was based on 10-percent discount rate and a 30-year alternative life.

The order-of-magnitude construction cost estimates presented have been prepared from the information available at the time of the estimate. Final costs of alternatives will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, continuity of personnel, engineering between the feasibility study and final design, and other variable factors. As a result, the final alternative costs will vary from the estimates presented in this report. Most of these factors are not expected to affect the relative cost differences between alternatives.

Construction, annual operation and maintenance, and present worth are summarized for each CAA alternative in Tables 3-6, to 3-13. Detailed cost tables for the alternatives are presented in Appendix A.

The cost summary tables also present a breakdown of the alternative costs attributable to the ECC and NSL sites. CAA alternative costs were first developed for each major component and then distributed to either ECC or NSL. Costs were most often distributed based on physical dimensions of the sites. As an example, the cost of the RCRA cap of Alternatives 3, 5, 6, 7, and 8 was separated into preliminary grading, cap construction, and vegetative cover. The preliminary grading component is required at NSL only and no costs were assigned to ECC. The remaining components were divided based on the percentage of the area to be covered. Since about 5 percent of the total cap area is ECC, the cap construction and vegetative cover costs were multiplied by 0.05 to arrive at the ECC cost. Appendix B presents the methodologies used for cost distribution for each alternative.

Table 3-6
COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a, b)
ALTERNATIVE 2 - ACCESS RESTRICTIONS WITH SOIL COVER AND LEACHATE COLLECTION AND TREATMENT

			NSL			ECC			Total	
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present North Replacement Cost	Average Annual Operation & Maintenance
Stabilize land surface Preliminary grading - MSL Run-off control Soil & vegetative cover Access roads - MSL		1, 923, 000 141, 000 655, 000 70, 000		171,000	35, 000		9,000	1, 923, 000 141, 000 691, 000 70, 000		180,000
Remove creek & leachate sediment		129,000						129,000		
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000		
Monitoring program		71,000		169,000	10,000		37,000	81,000		206, 000
Leachate collection - MSL		435,000		2, 300				435,000		2,300
Leachate treatment - NGL		1,426,000	154,000	549,000				1,426,000	154,000	549,000
Access restrictions		101,000		3, 100	17,000		500	118,000		3,600
CONSTRUCTION SUBTOTAL		5, 030, 000			89,000			5, 119, 000	****	····
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5% 10% 15% 20%	252,000 503,000 755,000 1,006,000			4,000 9,000 13,000 18,000			256,000 512,000 768,000 1,024,000		
CONSTRUCTION TOTAL		7,546,000			133,000			7,679,000	******	
Permitting & Legal Services during construction	5\$	377,000 246,000			7,000 4,000			384,000 250,000	_	
TOTAL IMPLEMENTATION COST		8, 169, 000			144,000			B, 313, 00 0		
Engineering design cost		393, 000			7,000			400,000		
TOTAL CAPITAL COST		\$8,562,000			\$151,000			\$8,713,000		
PRESENT WORTH REPLACEMENT COST			\$154,000			\$0			\$154,000	
ANNUAL OPERATION & MAINTENANCE				\$894,000			\$47,000			\$941,000
TOTAL PRESENT WORTH (c)				\$17,501,000			\$613,000			\$18, 114, 000 (d)

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30 percent, and are rounded to the nearest \$1,000.
b. Construction costs, subtotals, contingencies, and final capital, OBM and present worth estimates are rounded to the nearest \$1,000.
c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.
d. Present worth taken from Appendix A.

DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCRA LANOFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

2. IF INCINERATION OF PACT SOLIDS AT \$ 0.50 / LB. IS REQUIRED, THE ADDITIONAL PRESENT MORTH (WHICH IS NOT INCLUDED) IS:

\$1,669,000

THE PRESENT WORTH OF THE PACT SOLIDS DISPOSAL IN A RCRA LANDFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT WORTH IS:

\$133,000

Table 3-7 COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a, b) ALTERNATIVE 3 - RCRA CAP, LEACHATE COLLECTION AND TREATMENT

			NSL			ECC		Total .			
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Horth Replacement Cost	Average Annual Operation & Maintenance	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000			
ECC Site Work					144,000			144,000			
Monitoring program		71,000		170,000	10,000		37,000	81,000		207,000	
RCRA Cap Preliminary grading Cap construction Vegetative cover		1, 918, 000 7, 669, 000 656, 000	477,000	171,000	336,000 35,000	21,000	9,000	1, 918, 000 8, 005, 000 691, 000	498,000	180,000	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Leachate treatment		1, 426, 000	163,000	427, 000				1,426,000	163,000	427,000	
Access restrictions		101,000		3, 100	17,000		500	118,000		3,600	
CONSTRUCTION SUBTOTAL		12, 483, 000			569,000			13,052,000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5# 10# 15# 20#	624,000 1,248,000 1,872,000 2,497,000			28,000 57,000 85,000 114,000		•	653,000 1,305,000 1,958,000 2,610,000			
CONSTRUCTION TOTAL		18, 724, 000			853,000			19,578,000			
Permitting & Legal Services during construction	5%	936, 000 383, 000			43,000 17,000			979, 000 400, 000			
TOTAL IMPLEMENTATION COST		20, 043, 000			913,000		*********	20, 957, 000			
Engineering design cost		430,000			20,000			450,000			
TOTAL CAPITAL COST		\$20, 473, 000			\$933,000			\$21,407,000			
PRESENT WORTH REPLACEMENT COST			\$640,000			\$21,000			\$661,000		
ANNUAL OPERATION & MAINTENANCE				\$773,000			\$47,000			\$819,000	
TOTAL PRESENT WORTH (c)				\$28, 497, 000			\$1,393,000			\$29,891,000 (d)	

NOTES:

- DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCRA LANDFILL.
 NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.
- 2. IF INCINERATION OF PACT SOLIDS AT 6 0.50 / LE. IS REQUIRED, THE ADDITIONAL PRESENT MORTH (WHICH IS NOT INCLUDED) IS:

\$795,000

THE PRESENT WORTH OF THE PACT SOLIDS DISPOSAL IN A ACRA LANGFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT MORTH IS:

\$64,000

a. Capital and operation and maintenance (DBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30 percent, and are rounded to the nearest \$1,000.
b. Construction costs, subtotals, contingencies, and final capital, DBM and present worth estimates are rounded to the nearest \$1,000.
c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.
d. Present worth taken from Appendix A.

Table 3-8 COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a, b) ALTERNATIVE 4 - SOIL COVER, GROOUNDMATER INTERCEPTION AND TREATMENT

			MSL			ECC		Total			
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	
Stabilize land surface Preliminary grading - NSL Run-off control Soil & vegetative cover Access roads ~ NSL		1, 923, 000 141, 000 656, 000 70, 000		172,000	35,000		9,000	1,923,000 141,000 691,000 70,000		181,000	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000			
ECC Site Nork					251,000			251,000			
Monitoring program		71,000		87,000	10,000		40,000	81,000		127,000	
Groundwater interception		160,000		2, 900	18,000		300	178,000		3, 200	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Groundwater collection - ECC					507,000		1,600	507,000		1,600	
Groundwater/Leachate Treatment		1,659,000	224,000	591,000	144,000	20,000	73, 000	1,803,000	244,000	664,000	
Access restrictions		101,000		3, 100	17,000		500	118,000		3, 600	
CONSTRUCTION SUBTOTAL		5, 423, 000			1,009,000			6, 432, 000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5% 15% 15% 20%	271,000 813,000 813,000 1,085,000			51,000 152,000 152,000 201,000			322,000 965,000 965,000 1,286,000			
CONSTRUCTION TOTAL		8, 405, 000			1,565,000			9, 970, 000			
Permitting & Legal Services during construction	5%	420,000 211,000			79,000 39,000			499,000 250,000			
TOTAL IMPLEMENTATION COST		9, 036, 000			1,683,000			10,719,000			
Engineering design cost		422,000			78,000			500,000			
TOTAL CAPITAL COST		\$9, 458, 000			\$1,761,000			\$11,219,000			
PRESENT MORTH REPLACEMENT COST			\$224,000			\$20,000			\$244,000		
ANNUAL OPERATION & MAINTENANCE				\$858,000			\$124,000			\$98 2,000	
TOTAL PRESENT NORTH (c)				\$17,876,000			\$2,965,000			\$20,841,000 (d	

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30 percent, and are rounded to the mearest \$1,000.
b. Construction costs, subtotals, contingencies, and final capital, OBM and present worth estimates are rounded to the mearest \$1,000.
c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.
d. Present worth taken from Appendix A.

NOTES:

1. DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REDUIRED.

2. IF INCINERATION OF PACT SOLIDS AT \$ 0.50 / LB, IS REQUIRED, THE ADDITIONAL PRESENT MORTH (MHICH IS NOT INCLUDED) IS:

\$1,923,000

THE PRESENT WORTH OF THE PRCT SOLIDS DISPOSAL IN A RORA LANGFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT WORTH IS:

\$154,000

Table 3-9
COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a,b)
ALTERNATIVE 5 - ACRA CAP, LEACHATE COLLECTION, AND MODIFIED GROUNDMATER INTERCEPTION AND TREATMENT

ECC.

			NSL		GROUNDMATER IN	ECC FENCENTUM HMD 1	MEATMENT		Total		
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present North Replacement Cost	Average Ammual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000			
ECC Site Work					251,000			251,000			
Monitoring program		71,000		87,000	10,000		39,000	81,000		126,000	
RCRA Cap Preliminary grading Cap construction Vegetative cover		1, 918, 000 7, 686, 000 684, 000	479, 000	171,000	579,000 36,000	36,000	9,000	1, 918, 000 8, 265, 000 720, 000	515,000	180,000	
Groundwater interception		326,000		2,300	57,000		400	383,000		2,700	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Groundwater/leachate treatment		1,659,000	224,000	461,000	144,000	20,000	57,000	1,803,000	244,000	518,000	
Access restrictions		101,000	•	3, 100	17,000		500	118,000		3,600	
CONSTRUCTION SUBTOTAL		13, 087, 000	*****		1, 121, 000			14, 208, 000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5# 15# 15# 25#	654,000 1,963,000 1,963,000 3,272,000			56, 000 168, 000 168, 000 280, 000			710,000 2,131,000 2,131,000 3,552,000			
CONSTRUCTION TOTAL		20, 939, 000			1, 793, 000			22, 732, 000			
Permitting & Legal Services during construction	5%	1,047,000 415,000			90, 000 35, 000			1, 137, 000 450, 000			_
TOTAL IMPLEMENTATION COST		22, 401, 000			1, 918, 000			24, 319, 000			
Engineering design cost		507,000			43,000			550,000			
TOTAL CAPITAL COST		\$22, 908, 000			\$1,961,000			\$24,869,000			
PRESENT MORTH REPLACEMENT COST			\$703,000			\$56, 000			\$759,000		
ANNUAL OPERATION & MAINTENANCE				\$726,000			\$106,000			\$832,000	
TOTAL PRESENT WORTH (c)				\$30,847,000			\$3, 074, 000			\$33, 921, 000	(d)

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30 percent, and are rounded to the nearest \$1,000.

b. Construction costs, subtotals, contingenc worth estimates are rounded to the nearest \$1,000.

c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.

d. Present worth taken from Appendix A.

1. DISPOSAL OF PRECIPITATION SLUGGE TO BE IN A RORA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

2. IF INCINENATION OF PACT SOLIDS AT \$ 0.50 / LB. IS REQUIRED, THE ADDITIONAL PRESENT WORTH (MHICH IS NOT INCLUDED) IS:

\$957,000

THE PRESENT WORTH OF THE PACT SOLIDS DISPOSAL IN A RCRA LANDFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT WORTH IS:

\$77,000

Table 3-10 COMBINED ALTERNATIVE ANALYSIS COST SUBMARY (a, b) ALTERNATIVE 6 - RCRA CAP, GROUNDMATERR ISOLATION AND TREATMENT

			NSL.			ECC			Total		
		Capital Cost	Present North Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present North Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present North Replacement Cost	Average Annual Operation & Maintenance	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000			
ECC Site Work					251,000			251,000			
Monitoring program		71,000		87,000	10,000		39,000	81,000		126,000	
RCRA Cap Preliminary grading Cap construction Vegetative cover		1, 918, 000 7, 686, 000 684, 000	479,000	172,000	579,000 36,000	36,000	9, 000	1, 918, 000 8, 265, 000 720, 000	515,000	181,000	
Groundwater isolation		1,007,000		7,600	192,000		1,500	1, 199, 000		9, 100	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Groundwater collection - ECC					507,000		1,600	507,000		1,600	
Groundwater/leachate treatment		1,861,000	88,000	468,000	162,000	8,000	58,000	2, 043, 000	96,000	526,000	
Access restrictions		101,000		3,000	17,000		600	118,000		3,600	
CONSTRUCTION SUBTOTAL		13, 970, 000			1,781,000			15, 751, 000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5% 15% 15% 25%	699, 000 2, 096, 000 2, 096, 000 3, 493, 000			89,000 257,000 257,000 445,000			786,000 2,363,000 2,363,000 3,938,000			
CONSTRUCTION TOTAL		22, 354, 000			2,849,000			25, 203, 000			
Permitting & Legal Services during construction	5#	1,118,000 444,000			142,000 56,000			1,260,000 500,000			
TUTAL IMPLEMENTATION COST		23, 916, 000			3,047,000		`	26, 963, 000			
Engineering design cost		532,000			68,000			600,000			
TUTAL CAPITAL COST		\$24,448,000			\$3, 115, 000			\$27,563,000			
PRESENT MORTH REPLACEMENT COST			\$567,000			\$44,000			\$611,000		
ANNUAL OPERATION & MAINTENANCE				\$739,000			\$110,000			\$849,000	
TUTAL PRESENT WORTH (c)				\$32,945,000			\$4, 339, 000			\$37,284,000	(d)

DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCRA LANOFILL. NO FIXATION OF THE SLUGGE ASSUMED TO BE REQUIRED.

2. IF INCINERATION OF PACT SOLIDS AT \$ 0.50 / LB. IS REQUISED, THE ADDITIONAL PRESENT WORTH (WHICH IS NOT INCLUDED) IS:

\$1,201,000

THE PRESENT WORTH OF THE PACT SOLIDS DISPOSAL IN A RCRA LANDFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT WORTH IS:

\$96,000

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30
b. Construction costs, subtotals, contingencies, and final capital, OBM and present worth estimates are rounded to the nearest \$1,000.
c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.
d. Present worth taken from Appendix A.

Table 3-11 COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a,b) ALTERNATIVE 7 - RCRA CAP, GROUNDWATERR ISOLATION, ECC VAPOR EXTRACTION

			NSL		ECC			Total	Total		
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Horth Replacement Cost	Average Annual Operation & Haintenance	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000			
ECC Site Nork					251,000			251,000			
Monitoring program		71,000		87,000	10,000		39,000	81,000		126,000	
RCRA Cap Preliminary grading Cap construction Vegetative cover		1, 918, 000 7, 686, 000 684, 000	479,000	172,000	579, 000 36, 000	36,000	9,000	1, 918, 000 8, 255, 000 720, 000	515,000	181,000	
Groundwater isolation		1,007,000		7,600	192,000		1,500	1,199,000		9, 100	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Groundwater collection - ECC					507,000		1,600	507,000		1,600	
Groundwater/leachate treatment		1,861,000	88,000	468, 000	162,000	8,000	58,000	2, 023, 000	96,000	526,000	
ECC soil vapor extraction					500, 000		47,000	500,000		47,000	
Access restrictions		101,000		3,000	17,000		600	118,000		3, 600	
CONSTRUCTION SUBTOTAL		13, 970, 000		•••	2,281,000			16,251,000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5x 15x 15x 25x	699, 000 2, 096, 000 2, 096, 000 3, 493, 000			114,000 342,000 342,000 570,000			813,000 2,438,000 2,438,000 4,063,000			
CONSTRUCTION TOTAL		22, 354, 000			3, 649, 000	***************************************		26,003,000			
Perwitting & Legal Services during construction	5x	000,811,1 000,444			182,000 106,000			1,300,000 550,000			
TOTAL IMPLEMENTATION COST		23, 916, 000			3, 937, 000			27,853,000			
Engineering design cost		532,000			118,000			650,000			
TOTAL CAPITAL COST		\$24,448,000			\$4,055,000			\$28, 503, 000			
PRESENT MORTH REPLACEMENT COST			\$567,000			\$44,000			\$611,000		
ANNUAL OPERATION & MAINTENANCE				\$739,000			\$157,000			\$896, 000	
TOTAL PRESENT WORTH (c)				\$33, 457, 000			\$5,892,000			\$39, 349, 000 (d)	

NOTES:

DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

2. IF INCINERATION OF PACT SOLIDS AT \$ 0.50 / LB. IS REQUIRED, THE ADDITIONAL PRESENT MORTH (WHICH IS NOT INCLUDED) IS:

\$1,201,000

THE PRESENT MORTH OF THE PACT SOLIDS DISPOSAL IN A RCRA LANDFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT MORTH IS:

\$96,000

a. Capital and operation and maintenance (OA with an expected accuracy of +50 to -30 percent, and are rounded to the meanest \$1,000. b. Construction costs, subtotals, contingencies, and final capital, OAM and present worth estimates are rounded to the meanest \$1,000. c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life. d. Present worth taken from Appendix A.

Table 3-12 COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a,b) ALTERNATIVE 8 - RCRA CAP, GADUNDMATER ISOLATION AND TREATMENT, ECC INCINERATION

			NGL		ECC Tota			Total	al		
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	
Remove creek & leachate sediment		129,000						129,000			
Reroute Finley Creek & unnamed ditch		78,000			27,000			105,000	+		
ECC Site Work					251,000			251,000			
Monitoring program		71,000		87,000	10,000		39,000	81,000		126,000	
RCRA Cap Preliminary grading Cap construction Vegetative cover		1, 918, 000 7, 686, 000 684, 000	479, 000	172,000	579,000 36,000	36,000	9,000	1, 918, 000 8, 265, 000 720, 000	515,000	181,000	
Broundwater isolation		1,007,000		7,600	192,000		1,500	1, 199, 000		9, 100	
Leachate collection - MSL		435,000		1,700				435,000		1,700	
Groundwater collection - EDC					507,000		1,600	507,000		1,600	
Groundwater/leachate treatment		1,861,000	88,000	468, 000	162,000	8,000	58,000	2,023,000	96,000	526,000	
ECC soil incineration					22,000,000			22,000,000			
Access restrictions		101,000		3,000	17,000		600	118,000		3,600	
CONSTRUCTION SUBTOTAL		13, 970, 000			23, 781, 000			37,751,000			
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	5# 15# 15# 25#	699, 000 2, 096, 000 2, 096, 000 3, 493, 000			1, 189, 000 3, 567, 000 3, 567, 000 5, 945, 000			1,888,000 5,663,000 5,663,000 9,438,000			
CONSTRUCTION TOTAL		22, 354, 000			38, 049, 000			60, 403, 000			
Permitting & Legal Services during construction	5%	1,118,000 444,000		•	1, 902, 000 556, 000			3,020,000 1,000,000			
TOTAL IMPLEMENTATION COST		23, 916, 000			40, 507, 000			64, 423, 000			
Engineering design cost		532,000			1,468,000			2,000,000			
TOTAL CAPITAL COST		\$24,448,000			\$41,975,000			\$66, 423, 000			
PRESENT WORTH REPLACEMENT COST			\$567,000			\$44,000			\$611,000		
ANNUAL OPERATION & MAINTENANCE				\$739,000			\$110,000			\$849,000	
TOTAL PRESENT MORTH (c)				\$32, 945, 000			\$43, 199, 000			\$76, 144, 000 (d)	

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of 450 to -30 percent, and are rounded to the nearest \$1,000.

b. Construction costs, subtotals, contingencies, and final capital, OBM and present worth estimates are rounded to the nearest \$1,000.

c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.

d. Present worth taken from Appendix A.

NOTES:

DISPOSAL OF PRECIPITATION SLUDGE TO BE IN A RCAA LANDFILL.
NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.
IF INCINERATION OF PACT SOLIDS AT \$ 0.50 / LB.
IS REQUIRED, THE ADDITIONAL PRESENT MORTH
(WHICH IS NOT INCLUDED) IS:
 \$1,201,000

\$1,201,000

THE PRESENT MORTH OF THE PACT SOLIDS DISPOSAL IN A RCRA LANDFILL, TO BE SUBTRACTED FROM THE TOTAL PRESENT MORTH IS:

\$96,000

Table 3-13 COMBINED ALTERNATIVE ANALYSIS COST SUMMARY (a,b) ALTERNATIVE 9 - ACCESS RESTRICTIONS WITH ONSITE RCRA LANDFILL

			MSL			ECC			Total	
		Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance	Capital Cost	Present Worth Replacement Cost	Average Annual Operation & Maintenance
Remove creek & leachate sediment		129,000						129,000		
Reroute Finley Creek & unnamed ditch		78, 000			27000			105,000		
Monitoring program		71,000		100,000	10000		45, 000	81,000		145,000
RCRA Landfill Site preparation Berm construction RCRA Multilayer liner Move contaminated soil and landfill contents		7, 290, 000 4, 534, 000 8, 505, 000 19, 893, 000			225000 140000 263000 615000			7, 515, 000 4, 674, 000 8, 768, 000 20, 508, 000		
Backfill excavated landfill RCRA multilayer cap		11,842,000 6,331,000	363,000	122,000	366000 196000	11000	4000	12, 206, 000 6, 527, 000	374,000	126,000
Access restrictions		95,000		3,000	15000		600	110,000		3,600
CONSTRUCTION SUBTOTAL		58, 768, 000			1,857,000			60, 625, 000		**************************************
Mobilization/demobilization Health & Safety Bid contingency Scope contingency	7% 5% 15% 35%	4, 114, 000 2, 938, 000 8, 815, 000 20, 569, 000			130,000 93,000 279,000 650,000			4,244,000 3,031,000 9,094,000 21,219,000		
CONSTRUCTION TOTAL		95, 204, 000			3,009,000			98, 213, 000		
Permitting & Legal Services during construction	5 %	4, 760, 000 679, 000			150,000 21,000			4, 911, 000 700, 000		
TOTAL IMPLEMENTATION COST		100, 643, 000			3, 180, 000			103, 824, 000	·	
Engineering design cost		969,000			31,000			1,000,000		
TOTAL CAPITAL COST		\$101,612,000			\$3,211,000			\$104,824,000		
PRESENT MORTH REPLACEMENT COST			\$363,000			\$11,000			\$374,000	
ANNUAL OPERATION & MAINTENANCE				\$225,000			\$50,000			\$275,000
TOTAL PRESENT MORTH (c)				\$104, 338, 000			\$3,747,000			\$108,086,000 (d)

a. Capital and operation and maintenance (OBM) cost estimates are order of magnitude level estimates with an expected accuracy of +50 to -30 percent, and are rounded to the nearest \$1,000.
b. Construction costs, subtotals, contingencies, and final capital, OBM and present worth estimates are rounded to the nearest \$1,000.
c. The estimated present worth is based on 10 percent discount rate, and 30-year alternative life.
d. Present worth taken from Appendix A.

ASSUMPTIONS

Total capital costs are those expenditures required to initiate and install a remedial action. Both direct and indirect costs are considered in the development of capital costs. Direct costs include construction costs or expenditures for equipment, labor, and materials required to install a remedial action. Indirect costs consist of engineering, permitting, supervising, and other services necessary to carry out a remedial action.

Because this feasibility study is conceptual and based on data available at the time, bid and scope contingencies were estimated to account for unknown costs. Bid contingencies account for a variety of factors that would tend to increase costs associated with constructing a given project scope, such as economic/bidding climate, contractors inexperienced in working on hazardous waste sites, contractors' uncertainty regarding liability and insurance on hazardous waste sites, adverse weather conditions, strikes by material suppliers, and geotechnical unknowns. Scope contingencies cover changes which invariably occur during final design and implementation. Scope contingencies include provisions for items such as inherent uncertainties in defining waste volumes and regulatory or policy changes that may affect FS assumptions. Allowances for price inflation and abnormal technical difficulties are not accounted for in the contingencies.

Present worth was determined over a 30-year period to allow for comparison of costs over that period. It should be noted that costs will continue to accrue where operation and maintenance is required after the 30-year period; however, the present-worth analysis does not reflect these additional costs. As per U.S. EPA guidance, no cost expenditures in the future are escalated to reflect inflation. A 10-percent discount rate is applied to future values in computing present worth.

Health and safety requirements are estimated to include Levels C and D personal protective equipment. During construction, vehicle decontamination would be required for all vehicles having direct contact with contaminated soil and landfill wastes. During final demobilization of equipment, the vehicles and hand equipment used onsite would be steam cleaned. Workers who would be exposed to the contaminated soil during onsite activities would receive physical examinations before and after all phases of activity involving direct worker exposure to contaminated elements of the site. These elements of health and safety measures are covered in a supervision/health and safety contingency designed to include costs incurred for work on hazardous waste sites above and beyond those incurred on traditional construction jobs.

GLT655/11

Chapter 4 U.S. EPA'S RECOMMENDED ALTERNATIVE

This chapter presents the process U.S. EPA used to obtain the recommended alternative for the ECC and NSL sites. The NCP [Section 300.68(i)] requires the U.S. EPA to select the "cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment." The NCP also requires U.S. EPA to select a remedial action that attains or exceeds applicable or relevant and appropriate federal public health and environmental requirements.

This chapter presents a summary of the alternatives discussed in Chapters 2 and 3 followed by a comparison and presentation of the recommended alternative. Since the development of alternatives for this feasibility study required many simplifying assumptions, the actual design features incorporated into the design of the recommended action may differ from the technologies described here. The objectives and major components of the alternative will remain the same.

A summary of the technical, public health, environment, institutional and cost evaluations of each alternative is presented in Table 4-1.

COMPARISON OF ALTERNATIVES

ALTERNATIVE 1--NO ACTION

The No Action Alternative does not mitigate or minimize the existing threats to public health and environment identified in the endangerment assessments for the sites and summarized in Chapter 1 of this report. Potential adverse effects exist for exposure to contaminants in soils, landfill contents, sediment, leachate, groundwater, and surface waters. Since remedial actions are required to mitigate or minimize these existing or potential exposures, the No Action Alternative is not recommended by U.S. EPA.

ALTERNATIVE 2--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION AND TREATMENT

Alternative 2 includes site fencing; deed restrictions preventing future site development or use of groundwater onsite; a soil cover; removal of contaminated sediment; rerouting of portions of Finley Creek and the unnamed ditch; long-term surface water, sediment, and groundwater monitoring; and leachate collection and treatment. The total present worth of this alternative is \$18,100,000. These actions are considered by EPA to be effective in mitigating and minimizing threats to public health and the environment from exposure

EVALUATION CRITERIA

Technical

ALTERNATIVE 1 No Action

Potential exists for adverse health effects resulting from exposure to subsurface soil, landfill contents, and leachate sediments and sediments in the old creek beds of Finley Creek. Soil cover at ECC may pose low level public health risk.

Potential exists for adverse effects to public health and environment from future releases of contaminants

Potential exists for adverse health effects from consumption of contaminated groundwater or fish that have bioconcentrated contaminants. Potential exists for adverse effects on public health and environment from future releases of contaminants to surface water.

ALTERNATIVE 2

Access Restrictions With Soil Cover, Leachate Collection and Treatment

Effective in protecting public health from direct contact with soil contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leachate discharge. Leachate collection and soil cover eliminates leachate discharges to surface water. Leachate can still migrate to groundwater.

Migration of contaminated groundwater to surface water is not eliminated. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement remedial action may not be available before public health or environment are

Monitoring frequency and comprehensiveness are critical to successful implementation.

Estimated time of design and construction is 6 months to 1 year.

ALTERNATIVE 3 Access Restrictions With RCRA Cap, Leachate Collection and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Long-

term reliability of deed restriction

implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent.

Migration of contaminated groundwater to surface water is not eliminated, although would be reduced relative to Alternative 2. Groundwater and surface water monitoring should allow detection of contaminants posing risks. However, sufficient time to implement mitigative action may not be available before health or environment are affected.

Monitoring frequency and comprehensiveness are critical to successful implementation.

Estimated time of design and construction is 1 to 2 years.

ALTERNATIVE 4

Access Restrictions With Soil Cover, Leachate Collection, Groundwater Interception and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of soil cover for an indefinite period. Longterm reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with leachate contaminants by eliminating surface leschate discharge. Leachate and groundwater collection and soil cover eliminates discharges to surface water. Leachate can still migrate to groundwater which is subsequently collected and treated.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater interception and treatment system.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional storage volume should be considered.

Estimated time of design and construction is 1 year.

ALTERNATIVE 5

Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Interception and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Long-term reliability of deed restriction implementation is unknown.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected and treated.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater interception and treatment system.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Estimated time of design and construction is 1 year.

Public Health and Environment

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

Minor dust releases and noise generation during site work.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation

Noise and dust generated by truck traffic during RCRA cap construction. effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation

Short-term adverse construction

Minor dust releases and noise generation during site work.

Aquatic habitat improves over time because of cessation of contaminant discharge to Finley Creek.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

Noise and dust generated by truck traffic during RCRA cap construc-

Aquatic habitat improves over time because of cessation of contaminant discharge to Finley Creek.

Institutional

Uncontrolled hazardous waste site does not meet goals of CERCLA. Groundwater in violation of drinking water quality criteria. Surface water exceeds ambient water quality criteria for protection of human health.

Water quality criteria may be violated. May need to acquire land and implement deed restrictions. The potential for releases of contaminated groundwater from the site continues, so policy of CERCLA may not be met.

Water quality criteria may be violated. May need to acquire land and implement deed restrictions. The potential for releases of contaminated groundwater from the site continues, so policy of CERCLA may not be met.

The CERCLA goal of protection of public health, welfare, and environment is achieved.

All standards will be met. CERCLA goal of protection of public health, welfare, and environment is

COST

Capital Annual Average Operation and Maintenance Total Present Worth

\$ 8,710,000

18,100,000

\$21,400,000

819,000

29,900,000

\$11,200,000

982.000

20.800.000

\$24,900,000

832,000 33,900,000

EVALUATION CRITERIA

Technical

Leachate Collection, Groundwater Isolation and Treatment

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Long-term reliability of deed restriction implementation is unknown

ALTERNATIVE 6

Access Restrictions With RCRA Cap.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates leachate discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected and treated.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater (solation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Estimated time of design and construction is 1 to 2 years.

ALTERNATIVE 7

Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Vapor Extraction

Effective in protecting public health from direct contact with contaminants given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Longterm reliability of deed restriction implementation is unknown.

Public health risk from future site excavation and direct contact, inhalation, and ingestion of VOC'sin ECC contaminated soil is reduced to below 10 cancer risk levels. Potential ADI exceedance for lead and cadmium is unchanged but mitigated by access restrictions and cap.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected

ECC soil vapor extraction greatly reduces generation of contaminated leachate.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Installation of cap over ECC would follow the 2 to 4 year operation period of soil vapor extraction. Total estimated time of design and construction is 3 to 6 years.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

ecause of cessation of contamination discharge to Finley Creek.

Noise and dust generated by truck traffic during RCRA cap construction.

goals will be met. Requires

ALTERNATIVE 9 Access Restrictions With Onsite RCRA Landfill

Effective in protecting public health Effective in protecting public health from direct contact with contaminants from direct contact with contaminants given proper implementation of deed given proper implementation of deed restrictions and maintenance of RCRA cap for an indefinite period. Longterm reliability of deed restriction implementation is unknown.

> Effective in protecting public health from direct contact with contaminants by eliminating surface leachate discharge. If properly constructed, the onsite RCRA landfill would prevent leachate discharges.

> > Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite.

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Long-term reliability of RCRA landfills has not been demonstrated though is believed to be good given proper maintenance.

Monitoring is essential to check the integrity of the landfill liner.

Estimated time of design and construction is 3 to 5 years.

Porential for exposure of construction workers during excavation is very

Access Restrictions With RCRA Cap, Leachate Collection, Groundwater Isolation and Treatment, and ECC Soil Incineration

ALTERNATIVE 8

restrictions and maintenance of RCRA cap for an indefinite period. Longterm reliability of deed restriction implementation is unknown. Public health risk from future site excavation and direct contact,

inhalation, and ingestion of organic contaminants in soil reduced to below 10 cancer risk levels. Potential ADI exceedance for lead and cadmium is unchanged but mitigated by access restrictions and cap.

Effective in protecting public health from direct contact with contaminants by eliminating surface water leachate discharge. Leachate collection and RCRA cap eliminates discharges to surface water. Leachate can still migrate to groundwater, but quantity is reduced by an estimated 90 percent. Groundwater is subsequently collected

ECC soil incineration greatly reduces generation of contaminated leachate.

Effective in eliminating direct consumption of groundwater given proper implementation of deed restrictions prohibiting installation of wells onsite

Groundwater isolation may eventually eliminate risk to public health from direct consumption of groundwater onsite by lowering the water table below zone of contamination

Effective in preventing migration of contaminated groundwater to surface water or offsite.

Monitoring results are important to reliable operation of groundwater isolation system. Frequent water level monitoring is necessary to assure low water table is maintained.

Releases from leaking drums or pools of immiscible fluids may migrate to the lowered water table and result in continued treatment of groundwater.

Failure of collection or treatment system is not likely to pose risk to public health or environment over the short-term at present contaminant levels. If leachate or groundwater contaminant levels increase in future, additional onsite storage volume should be considered.

Groundwater isolation system provides additional time for further remediation if failure detected.

Installation of cap over ECC would follow the 3 to 4 years implementation period of ECC soil incineration. Total estimated time of design and construction is 4 to 6 years.

Public Health and Environment

Short-term adverse construction effects on equatic habitat likely due to stream relocation will be mitigated by stream rehabilitation

traffic during RCRA cap construction.

Aquatic habitat improves over time because of cessation of contaminant discharge to Finely Creek.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

ecause of cessation of contaminant discharge to Finley Creek.

Noise and dust generated by truck traffic during RCRA cap construction.

Release of contaminants to the air or surface water during ECC soil excavation could occur.

Short-term adverse construction effects on aquatic habitat likely due to stream relocation will be mitigated by stream rehabilitation.

ecause of cessation of contaminant discharge to Finely Creek.

Releases of contaminants to the air or surface water during landfill excavation could occur.

Short-term generation of noise and dust from truck traffic and heavy equipment operation onsite during RCRA landfill construction.

All standards will be met. CERCLA

Institutional

All standards will be met. CERCLA goal of protection of public health, welfare, and environment is achieved.

All standards will be met. CERCLA goal of protection of public health, welfare, and environment is achieved. All standards will be met. CERCLA delisting of residue to dispose of it onsite. No permits required but need to follow technical requirements.

goal of protection of public health, welfare, and environment is achieved.

COST

Capital Annual Average Operation and Maintenance Total Present Worth

\$27,600,000

849,000

37,300,000

\$28,500,000 896.000

39,300,000

\$66,400,000

849,000 76,100,000 \$105,000,000 275,000

108,000,000

to contaminated soils, landfill contents, sediment and leachate.

The remedial actions do not address leaching of contaminants to the groundwater or migration of contaminated groundwater to surface water. This alternative relies on monitoring to detect increases in contaminant levels or types in groundwater and surface water. Because groundwater monitoring locations of necessity are located very near surface water discharge areas, there may not be sufficient time for implementation of remedial actions before adverse effects occur if previously undetected contaminants or increased levels of contaminants are detected. Since the potential for increasing contaminant levels or types is great because of the heavily contaminated ECC soils and the reported large quantities of hazardous waste disposed of at NSL, monitoring alone is not considered a reliable means of protecting the public health and environment. Therefore, Alternative 2 is not recommended by EPA.

ALTERNATIVE 3--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION AND TREATMENT

Alternative 3 includes the components of Alternative 2, but with a RCRA cap substituted for the soil cover. The present worth of Alternative 3 is \$29,900,000. The cap would reduce leaching of contaminants to the groundwater by an estimated 90 percent and as a result it would reduce the potential for contaminant levels to increase in the future. Migration of groundwater contaminants to surface water, however, would not be mitigated and, as with Alternative 2, protection of public health and environment would be dependent on groundwater and surface water monitoring. As discussed earlier, monitoring alone is not considered reliable. Alternative 3 is not considered to provide adequate protection of public health and the environment and is not recommended by EPA.

ALTERNATIVE 4--ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION AND TREATMENT

Alternative 4 includes the components of Alternative 2 and in addition incorporates groundwater interception and treatment to prevent contaminated groundwater from migrating offsite or discharging to the unnamed ditch or Finley Creek. The present worth cost is \$20,800,000.

This alternative is considered effective in protecting public health and the environment from site contamination. The groundwater and leachate collection and treatment systems, however, would be required to operate for a long period of time, possibly in excess of 100 years, because contaminants could continue to leach from soils and landfill

contents. Though groundwater collection and treatment has been shown to be reliable, continued maintenance and operation far into the future cannot be assured.

ALTERNATIVE 5--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION AND TREATMENT

Alternative 5 includes the components of Alternative 4, but substitutes a RCRA cap for the soil cover. The present worth of Alternative 5 is \$33,900,000. The cap would reduce leaching of contaminants from the unsaturated zone to the groundwater by an estimated 90 percent and, as a result, could reduce the potential for contaminant levels to increase in the future. It is possible that the cap may also reduce the operational period for the groundwater collection and treatment system, though the actual period of operation cannot be reliably estimated.

ALTERNATIVE 6--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT

Alternative 6 includes all the components of Alternative 5 with the exception of the groundwater collection system. The total present worth is \$37,300,000. The groundwater isolation system employed in Alternative 6 lowers the groundwater table below the zone believed to be currently contaminated. The intent is to isolate contaminants in the unsaturated zone so they cannot migrate in groundwater. Eventually the groundwater would no longer be contaminated and treatment would not be necessary. This may occur when the water table is fully lowered, estimated to be 5 years. It is possible, however, that contaminants released from buried drums or immiscible fluids could migrate to the lower water table. As a result, the reliability of the groundwater isolation system to reduce the operational period of groundwater treatment is not assured. In addition, the groundwater collection system would have to be operated indefinitely to maintain the lower water table. As with Alternatives 4 and 5, the reliability of long-term maintenance and operation of the collection system is urknown.

The isolation system of Alternative 6 does provide substantially more time between a potential collection system failure and a release of contaminants to surface water. This occurs because of time necessary for the water table to rise onsite and groundwater gradients reverse. Since the time available under Alternatives 4 and 5 is considered substantial, this is not considered a significant benefit.

ALTERNATIVE 7--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL VAPOR EXTRACTION

Alternative 7 includes all components of Alternative 6 and adds soil vapor extraction for ECC-contaminated soil. The present worth is \$39,300,000.

The major public health and environmental benefit of soil vapor extraction is the removal of the relatively mobile volatile organic compounds (VOC's) from the soil. results in a reduced potential for human exposure or overland migration of VOC contaminants offsite in the event of site The probability of site development, in violation of deed restrictions, at some point in the future is not known but is believed to be minimal because of the presence of the immediately adjacent NSL site. If site development were to occur, health threats from exposure to other organic and inorganic contaminants would still be Removal of VOC's from the unsaturated zone would have little effect on the operational period of the groundwater collection system since these contaminants would be nearly immobilized by the construction of a RCRA cap over the ECC site.

Because a public health threat would remain in the event of future ECC site development and because removal of VOC's from the unsaturated zone is not expected to affect ground-water collection and treatment, the advantages of soil vapor extraction are not considered great. The expenditure of \$2,000,000 in present worth for ECC soil vapor extraction for the marginal reduction in health threat is not considered cost effective. Alternative 7 is not recommended by EPA.

ALTERNATIVE 8--ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION, GROUNDWATER ISOLATION AND TREATMENT, AND ECC SOIL INCINERATION

Alternative 8 is similar to Alternative 7 with the exception of ECC soil incineration in place of soil vapor extraction. The present worth of Alternative 8 is \$76,100,000. ECC soil incineration would result in the destruction of all organic contaminants in soil in the unsaturated zone with contaminants above the 10 cancer risk level. The resulting reduction in health threats in the event of future site development would be greater than in Alternative 7. The presence of NSL adjacent to ECC and the restrictions on the deed preventing site development make this unlikely. The present worth of \$38,800,000 for ECC soil incineration for reducing public health threats in the unlikely event of future site development is not considered cost effective. Alternative 8 is not recommended by EPA.

ALTERNATIVE 9--ACCESS RESTRICTIONS WITH ONSITE RCRA LANDFILL

Alternative 9 includes deed restrictions; excavation of the landfill contents, peripheral soils, sediments, and ECC-contaminated soil; and disposal of the waste materials in an onsite RCRA type landfill. The present worth is \$108,000,000. The new landfill would include a double liner, leachate collection system, leachate and groundwater monitoring system, gas collection system, and multimedia cap.

The new landfill would effectively isolate the contaminants from the environment. Operation and maintenance of the facility would be required indefinitely. Though long-term reliability of the facility is believed to be good, proper operation and maintenance far into the future cannot be assured. Exposure of workers to the hazardous materials may occur during excavation of ECC soils and the landfill. Also inadvertent releases to the environment by volatilization or surface erosion during the several years of construction activity would likely occur. The expenditure of \$108,000,000 in present worth is not considered cost effective by EPA when the hazards induced by site excavation are considered and the availability of a lower cost alternative with a similar level of protection for the public health and environment.

COMPARISON OF ALTERNATIVES 4, 5 AND 6

Alternatives 4, 5 and 6 were all found to provide adequate protection of public health, welfare, and environment, if they are operated and maintained through the period of continued contaminant release. Since this period may be in excess of 100 years, an important consideration in alternative selection is to minimize the operation and maintenance necessary, particularly in regards to collection and treatment of contaminated leachate and groundwater. Generally, the less operation and maintenance required the more reliable the system will be in the future.

Alternative 4 requires the greatest amount of treatment for leachate and groundwater since it does not include a RCRA cap. An estimated 40 gpm of leachate and 100 gpm of groundwater may require treatment in excess of 100 years. In comparison to Alternatives 5 and 6, which include a RCRA cap, Alternative 4 would have the poorest long-term reliability for continued effective operation.

Alternatives 5 and 6 both reduce leachate generation to an estimated 5 gpm as a result of the RCRA cap. The groundwater isolation system of Alternative 6 could reduce the need for treatment to leachate only. This could occur as early as 5 years. For the reasons noted earlier, however, this is

uncertain and treatment of groundwater may be required indefinitely, as is the case for Alternative 5. In addition, Alternative 6 would require operation and maintenance of the collection system indefinitely, irrespective of whether treatment is necessary.

Comparison of the costs of Alternatives 5 and 6 show Alternative 6 with the following higher costs:

- o \$2.7 million more in capital cost because of the groundwater isolation system
- o \$17,000 more in annual operation and maintenance costs (assuming 15 years of groundwater treatment for Alternative 6) as a result of high initial flow rates
- o \$3.4 million more in present worth

The present worth of Alternative 6 would still be \$1.6 million more than Alternative 5 if treatment of groundwater could be terminated after 1 year. Groundwater treatment beyond 15 years would result in even greater cost differences between Alternatives 5 and 6. Because of the greater costs of Alternative 6 and the uncertainty regarding the period treatment of groundwater it is not recommended by EPA.

RECOMMENDED ALTERNATIVE

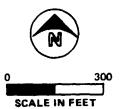
U.S. EPA's recommended alternative is Alternative 5. The major components of the alternative are:

- o Access restrictions
- o Cooling pond sludge removal
- o RCRA cap and surface controls
- o Monitoring
- o Leachate collection
- o Groundwater interception
- o Treatment

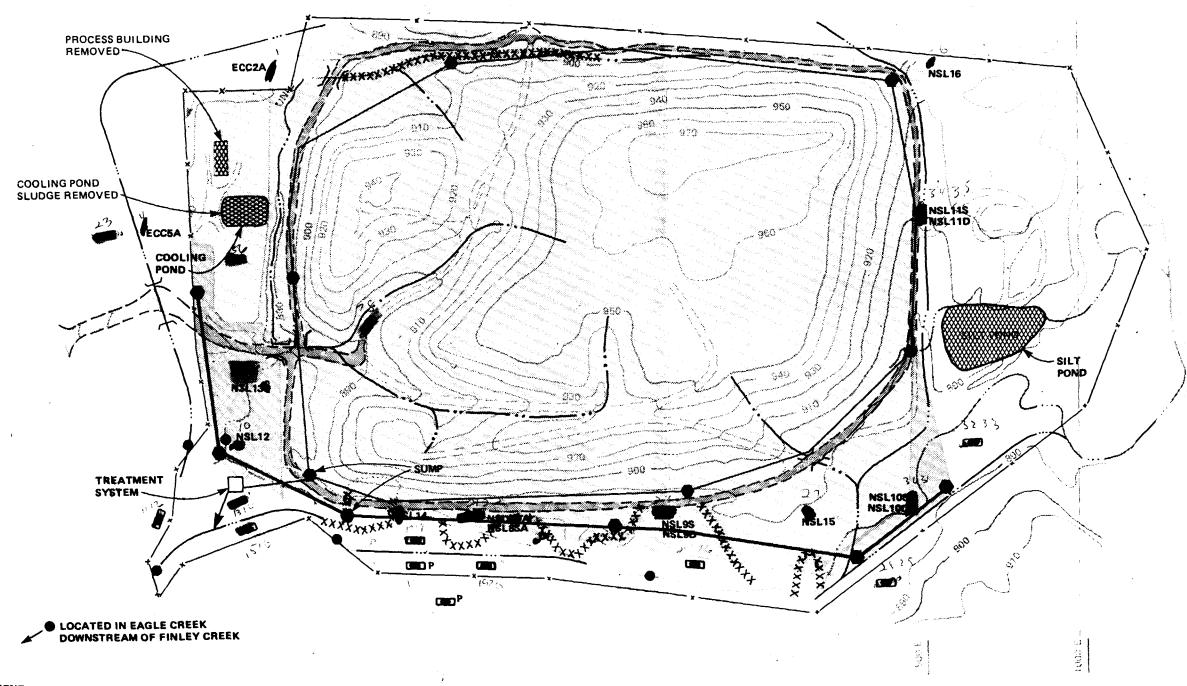
A site plan and cross sections of Alternative 5 are shown in Figures 4-1, 4-2 and 4-3.

ACCESS RESTRICTIONS

Deed restrictions would be placed on the landfill property and the ECC site. The restrictions should prevent future development of the land to protect against direct contact with contaminants or further migration that could result from site excavation and development. The deed restrictions should also prohibit use of groundwater or installation of wells onsite. Access to the site would be controlled by completing the fencing around the site perimeter and posting signs.







LEGEND

-- REROUTED CREEK

NSL10S NSL10D

EXISTING MONITORING WELL NEST

O NSL15

EXISTING MONITORING WELL

NEW MONITORING WELL NEST

NEW PIEZOMETER NEST

NEW DEEP WELL

SURFACE WATER/SEDIMENT SAMPLING LOCATION

GROUNDWATER INTERCEPTION SYSTEM (CONSISTS OF FRENCH DRAINS

NEW DITCHES) (CULVERT __ ROAD IMPROVEMENTS

EXTRACTION WELL

MANHOLE

Peristing well.

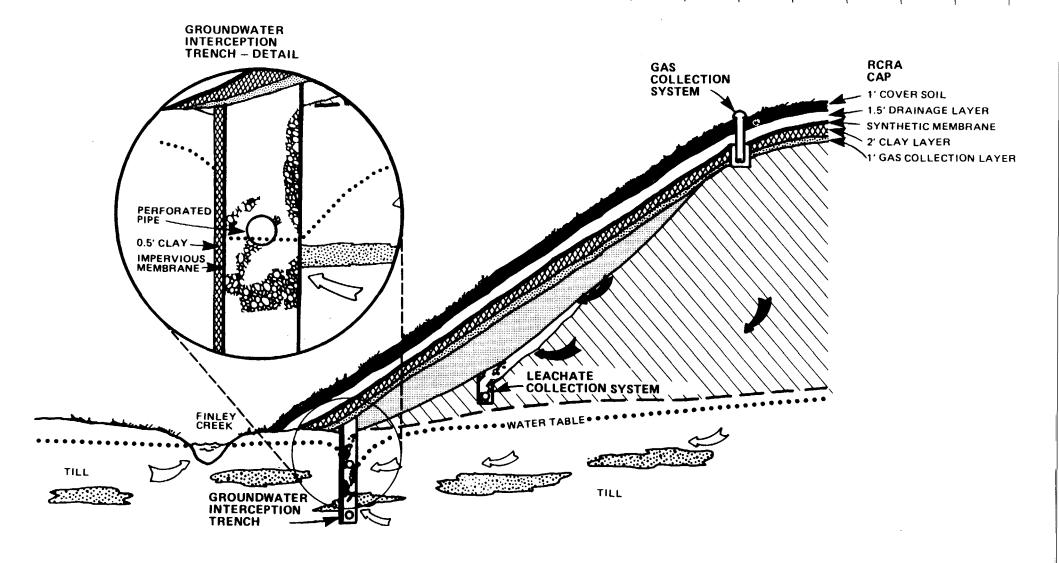
- NEW FENCE

- NEW LEACHATE COLLECTION SYSTEM

XXXXXXX SEDIMENT REMOVAL

AREA OF RCRA CAP

FIGURE 4-1 RECOMMENDED ALTERNATIVE **ACCESS RESTRICTIONS WITH RCRA** CAP, LEACHATE COLLECTION, GROUNDWATER INTERCEPTION, AND TREATMENT ECC-NSL CAA



NOT TO SCALE

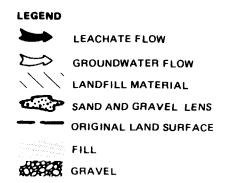


FIGURE 4-2
RECOMMENDED ALTERNATIVE
NSL — CORTH/SOUTH CROSS SECTION
ECC-NSL CAA

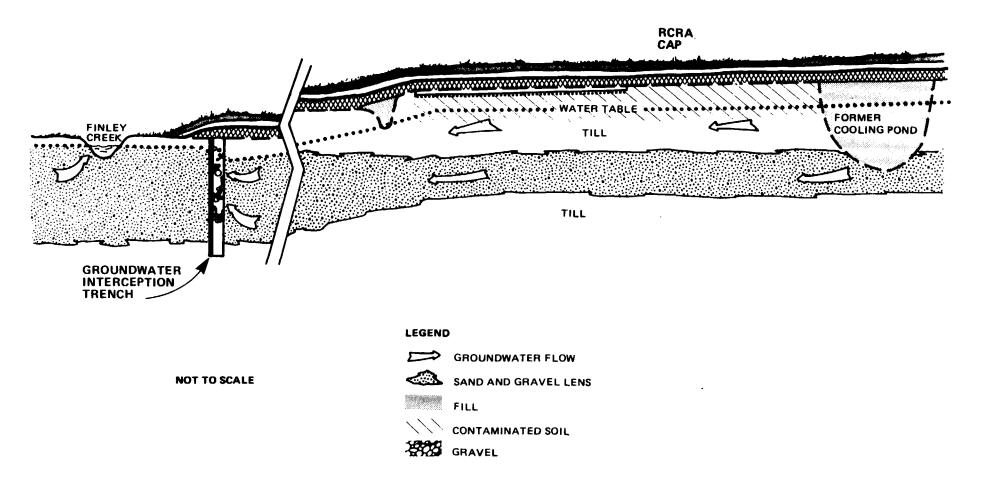


FIGURE 4-3
RECOMMENDED ALTERNATIVE
ECC - NORTH/SOUTH CROSS SECTION
ECC-NSL CAA

COOLING POND SLUDGE REMOVAL

Contaminated sludge or soil remaining in the former ECC cooling pond would be excavated and disposed of at a licensed RCRA landfill. Soil samples would be collected from soil borings in the former cooling pond and analyzed to determine excavation locations and volumes. Excavated sludge or soil would be replaced with clean fill. Removal of the remaining contaminated sludge would reduce contamination of the sand and gravel deposit beneath ECC. Groundwater removed during sludge excavation would be transported and treated at a licensed RCRA facility or treated onsite in the groundwater treatment system.

RCRA CAP AND SURFACE CONTROLS

These actions include removal of contaminated sediment, rerouting of creeks, and construction of a multimedia cap over ECC and NSL.

Contaminated leachate sediment and sediment in the ditch north of NSL and the old creek beds of Finley Creek would be excavated, dewatered, and disposed of onsite beneath the cap. It was assumed for cost estimating that excavation to a 1-foot depth would be necessary and a total of 4,200 cubic yards would be removed. The actual volume removed would be dependent on further sampling undertaken as part of final design. The creek beds would be backfilled and a soil cover would be placed over areas not under the cap. Contaminated water resulting from the dewatering of the sediment would be treated in the onsite treatment system.

The unnamed ditch would be rerouted to the west of ECC and portions of Finley Creek would be rechannelized as shown in Figure 4-1. This would route the surface waters farther away from contaminated areas and increase the time available between contaminant detection in groundwater and discharge to Finley Creek or the unnamed ditch.

The RCRA cap would cover both ECC and NSL and include two low permeability layers. From top to bottom, the cap includes 1 foot of soil for vegetative growth, 1.5 feet of a sand and gravel for drainage, a 30-mil synthetic membrane, 2 feet of clay, and 1 foot of sand (for gas collection on the landfill only). Prior to placing the cap, the site would be graded to eliminate sharp grade changes and to provide for drainage. Also the former process building on the ECC site would be demolished. The concrete floor and foundation would remain and the cap placed on top. The cap would be seeded to control erosion and promote evapotranspiration.

The RCRA cap is expected to reduce the rate of leachate production from 40 gpm to 5 gpm within 5 years. The resulting leachate flowrate requiring treatment would also decrease from 40 gpm to 5 gpm.

MONITORING

Contaminant migration would be assessed through a regular leachate, groundwater, and surface water monitoring program. Leachate would be sampled at the leachate collection sump as part of the leachate collection and treatment system. Groundwater would be monitored during the first year using 15 of the existing wells and an additional 26 new monitoring wells (see Figure 4-1). The 41 monitoring wells would be sampled quarterly the first year and analyzed for the full organic and inorganic priority pollutant list.

Monitoring well sampling would be reduced dependent on results of the four initial sample rounds. It is estimated that subsequent semiannual sampling would be necessary at 14 wells. Samples would be analyzed for VOC's, semivolatiles, and inorganics. Water levels of monitoring wells would be taken at the time of sampling and gradients would be calculated.

Surface water and sediment would be sampled at eight locations semiannually. These samples would be analyzed for VOC's, base/neutrals, pesticides, PCB's, and inorganics. Depending on surface water results, fish may be occasionally collected from Finley and Eagle Creek and their tissues analyzed for bioaccumulation of organic contaminants.

LEACHATE COLLECTION

The leachate collection system would consist of a French drain encircling the landfill. The drain would be about 4 feet deep and about 6,000 feet in length. Perforated pipe laid in the trench would be used to transport leachate to a sump located near the treatment system in the southwest corner of the site. The trench would be backfilled with gravel. A 1-foot layer of gravel would also be placed on the sideslopes of the landfill to provide a drainage path for leachate seepage. The RCRA cap described previously would extend over the gravel layer and the drainage trench. The existing leachate collection system would be decommissioned and abandoned.

GROUNDWATER INTERCEPTION

The objective of the groundwater collection system is to prevent contaminated groundwater from migrating past the perimeter of ECC and the landfill and discharging to surface waters. The collection system costed and described here for

this alternative will meet this objective based on the information available to date. Further site investigations during final design may alter the design of the collection system; however, the objective of the groundwater interception system will be met.

The groundwater collection system costed consists of a French drain installed along the southern and southwestern boundaries of the landfill and ECC. The trench would be about an average depth of 25 feet (see Figures 4-1, 4-2, and The trench would include two collection pipes, one set 5 feet below the existing water table to function as the interception system, and the other set at the bottom of the trench to be used if the isolation system is implemented at a later time. It is anticipated that an approximate 5-foot overall drawdown of the water table at the collection system would be sufficient to prevent groundwater movement past the The French drain would include an impermeable barrier on the south wall of the trench to minimize inflow of water from Finley Creek. The barrier consists of an impermeable synthetic membrane and at least 6 inches of compacted clay. It would extend 3 feet into the till below the sand and gravel deposit in the southwest area of the The barrier would also extend 75 feet beyond the western end of the drain.

The initial combined flowrate from the leachate and ground-water collection systems is estimated to be 100 gpm with 40 gpm from the leachate collection system. Within 5 years, the flow is estimated to decrease to about 65 gpm because of a reduction in leachate generation.

TREATMENT

Treatment of leachate and groundwater will be required to meet effluent discharge limits set in the NPDES permit for discharges to Finley Creek. The limits likely applicable are presented in Table 2-4. The limits must protect aquatic life and human health from consumption of aquatic organisms and human health from use of the downstream Eagle Creek Reservoir as a drinking water supply.

The onsite treatment system costed and described here will be capable of meeting the effluent limits. During final design, the treatment system will likely be modified based on pilot and bench-scale testing and more detailed evaluations of capital and operation and maintenance costs. The objective of meeting the discharge limits will be obtained, however.

Leachate and groundwater would be pumped to an onsite treatment plant consisting of precipitation, biological oxidation, and carbon adsorption. The two streams would be

combined in a 100,000-gallon holding tank. In the treatment system, the waste stream first passes through the precipitation process for removal of metals and other inorganics. Chromium, copper, iron, lead, and zinc were detected in the groundwater and leachate samples and can be removed by precipitation. Hydroxide precipitation is used for cost estimating purposes. Flocculation and clarification follow the chemical addition and can be accomplished in one basin. Either flocculation with lamella gravity settlers or solids contact clarifiers could be used. Sludge is removed from the bottom of the basin and can be thickened, dewatered with a filter press, and disposed of in a RCRA landfill.

Effluent from the precipitation process then goes through powdered activated carbon treatment (PACT), which is a patented activated carbon enhanced biological treatment system. The PACT system combines biological treatment and carbon adsorption into one process. The system works through the addition of powdered activated carbon to the influent of the activated sludge process. The system consists of carbon feeding equipment, an aeration basin with the necessary appurtenances, a clarifier, and solids handling equipment. Solids would be wasted to an aerobic digester followed by dewatering. Solids would then be disposed of at a RCRA landfill unless they could be delisted as a nonhazardous waste. Spent carbon in the waste solids could be separated and regenerated offsite.

Granular media filtration would be included in the treatment system following either the precipitation system or the PACT system or both. The advantage of having a filter after each unit would be that less metals would carry over into the PACT system and that solids with low settleability would be removed from the biological system effluent. For costing purposes, however, it is assumed that one filter will be used after the PACT system.

OPERATION AND MAINTENANCE REQUIREMENTS

Maintenance would be required for the cap because of erosion, freeze/thaw, and landfill settlement. It was estimated that every fifth year, 10 inches of fill over 50 percent of the landfill would need replacement. Regular mowing of grass on the cap is required. Routine inspections of the cap surface and the leachate and groundwater collection systems would be required semiannually. Replacement of collection system pumps, cleaning of collection system drains, and refurbishment of monitoring well screens would be undertaken as necessary.

The treatment system would require full-time operators to perform testing and maintenance, to adjust chemical and carbon feed rates, and to ensure that all process units are

functioning properly. To provide for regular maintenance or in the event of treatment system failure, a 100,000-gallon holding tank is included. This tank provides a 2-day holding time for untreated leachate.

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West, T.R., <u>Geologic and Geohydrologic Evaluation of the Northside Sanitary Landfill Site</u>, <u>Zionsville</u>, <u>Indiana</u>, <u>Unpublished</u>, <u>September 27</u>, 1982.

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Appendix A
DETAILED COST TABLES

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTIONS AND TREATMENT

DESCRIPTION	PUANTITY		UNIT PRICE	TOTAL C		ASSUMPTIONS
DIRECT CAPITAL COSTS						
. STABILIZE LANDFILL SURFACE						
PRELIMINARY GRADING CUT FILL	53500	CY	6	321,000		TO PREVENT PONDING TOPHON EARTH, EICAVATE AND HAUL (SCRAPERS) TUSE DHSITE SOIL (COMMON EARTH), COMPACTED
MATERIAL Placement	178000 178000	CY	6 3	1,068,000 534,000		Sale Sale Sale Sales
RUN-OFF CONTROL DITCHING RIPRAP FIRM PROFESSION OF COMES	1760 1760	CY SY	7 6	10,560 130,240		DITCH 2 FT. WIDE, 3 FT. DEEP, 7020 FT. LDWG
ESTABLISH VEGETATIVE COVER SOIL HYDROSEED	119000 3207000	CY SF	0.03	595,000 96,210		IDNSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
IMPROVE ACCESS ROADS COMPACT SUBGRADE GEOTEXTILE BASE GRAVEL CULVERT BELOW ROADS	3300 9900 3700	SY SY CY	2 2 8	19,800 19,800 26,400		12 OZ. TREVIRA CRUSHED STONE SUBBASE, 12°
ELEVENT BELOW NORMS ELGAVATE PIPE BACKFILL PIPE BEDDING	27	CY LF CY LF	7 11 11 2	238 2,530 297 460		DITCH 2 FT. WIDE, 2 FT. DEEP 12° DIA., BITUM. COATED INVERT SAND BACKFILL
	TOTAL				\$2,825,000	
. REMOVE CREEK AND LEACHATE SEDIMENT						1 1 1
EXCAVATE BACKFILL EXCAVATION	4200	CY	8	33,600		EXCAVATE SAND & GRAVEL (MET)
MATERIAL PLACEMENT ESTABLISH VEGETATIVE COVER	4000 4000	CY	10 5	40,000 20,000		CLAY BACKFILL 300 HAUL, 4° LIFTS, 4 PASSES
SOIL HYDROSEED		CY SF	0.03	34,000 1,836		ONSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
SUB	TOTAL .				\$129,000	1 1 1
. REROUTE FINLEY CREEK AND UNNAMED DI	rch :					4300 FT. RERBUTED
EXCAVATE NEW CREEK BED RIPRAP	3255 540	CY	20 74	65,100 39,960		TILL, EXCAVATE AND HAUL (MET)
SUB	TOTAL .				\$105,000	
, MONITORING PROGRAM						
NONITORING WELLS 11 - UPPER GLACIAL TILL 13 - MID-DEPTH	320 490	LF LF	60 60	19,200		SHALLOM - HOLLOM STEM AUGER
2 - DEEP SAND AND GRAVEL PIEZOMETERS		ĹF	75	29,400 26,250		DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
2 - UPPER GLACIAL TILL 2 - MID-DEPTH	46 70	LF LF	90 90	2,400 4,200		SHALLOW - HOLLOW STEM AUGER
SUB	OTAL				\$81,000	
. LEACHATE COLLECTION SYSTEM	į					
EXCAVATE TRENCH LINE TRENCH	2540	CY	8	20,320		4' DEEP, \$ DOUBLED FOR H & S
PERVIOUS GEOTEXTILE PERFORATED PIPE	62900 5720		0.17	10,693 34,320		: :: :METAL, B° DIA., 16 GAGE
GRAVEL BACKFILL SUMP/PUMP STATION	: 24150		15 4500	34,320 362,250 4,500		IN TRÊNCH & UP SLOPE
MANHOLES		ĒΑ	650	3,250		FIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS PRECAST CONC., 4 ID, 6 DEEP

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTIONS AND TREATMENT

DESCRIPTION	QUANTITY			TOTAL	COST	ASSUMPTIONS
DIRECT CAPITAL COSTS						
SUBTOTAL					\$435,000	
6. LEACHATE TREATMENT		:	:			DESIGN RATE OF 40 GPM
INFLUENT PUMPING EQUALIZATION/STORAGE PUMPS	1 2	LS EA	100,000 6,600	100,000 13,200		100,000 GALLON EQUALIZATION/STORAGE TAMK SUBNERSIBLE PUMP
PRECIPITATION SYSTEM IN-LIME NIJER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TAMK MEUTRALIZATION TAMK PILOT TESTING STARTUP		EA LS LS LS LS LS	850 37,000 47,000 1,200 2,000 5,000 500	850 37,000 47,000 1,200 2,000 5,000 2,500		2 IN. IN-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 cu ft FRP TAMK STEEL TAMK
PACT SYSTEM PACT PACKAGE FILTER PRESS PILOT TESTING STARTUP	1	LS LS LS Day	270,000 47,000 20,000 500	270,000 47,000 20,000 2,000		MODEL 55-A J-PRESS, 15 cu ft
GRANULAR MEDIA FILTER	1	LS	48,000	48,000		AVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING	: 1	LS LS SF	12,000 41,000 25	12,000 41,000 750,000		
SITE WORK SITE PREPARATION CLEARING GRADING LEVELING	2200 6700 1100		4 1 3	8,800 6,700 3,300		SITE AREA: 300 FT X 200 FT, 1 FT DEPTH, 6 IN LEVEL
SITE DRAIMAGE Excavation Pipe Backfill	100	CY LF :CY	6	200 600 300		:3 FT DEEP X 4 FT WIDE, 100 FT TRENCH
ACCESS ROAD ROAD BASE ROAD		SY	2 15	900 6,750		20 FT NIDE BY 200 FT LONG
SUBTOTAL					1,426,000	
7. ACCESS RESTRICTIONS FENCING GATE	9300 2	LF EA	12 2000	111,600 4,000		6' CHAIN LINK WITH BARBED WIRE
SIGNAGE	62	EA	33	4,000 2,046		L SIGN EVERY 150 FT. ALONG FENCE
SUBTOTAL					\$118,000	
CONSTRUCTION SUBTOTAL					\$5,119,000	
B. CONTINGENCIES						
MOBILIZATION/DENOBILIZATION (5 %) HEALTH AND SAFETY (10 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (20 %)				256,000 512,000 768,000 1,024,000		
CONSTRUCTION TOTAL					\$7,679,000	

CONBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTIONS AND TREATMENT

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					10. ENEINEERING
		\$8,313,000			TOTAL IMPLEMENTATION COST
		220,000 284,000			FERNITING (5.2) Services during construction
					9. 01468
					STROT CAPITAL COSTS
	SW0114PW22A	T203 JAT01	UNIT PRICE	YTITMAUQ	M01141X530

5 3889

APPENDIT TABLE A-2

COMPINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	********	ASSUMPTIONS	
REPLACEMENT COSTS							
I. TREATMENT PLANT						REPLACEMENT AT YEAR 15, FLOWRATE OF 40 GPM	
IMFLUENT PUMPING EDUALIZATION/STORAGE PUMPS	1 2	LS EA	000,000 6,600	1 0 0,000 13,200		100,000 SALLOM EQUALIZATION/STORAGE TANK SUBMERSIBLE FUMP	
PRECIPITATION SYSTEM IN-LINE MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK MEUTRALIZATION TANK STARTUP		EA LS LS LS LS LS	850 37,000 47,000 1,200 2,200 500	47,000 1,200		2 IN. IM-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 CU FT FRP TANK STEEL TANK	
PACT SYSIEM PACT PACKAGE FILTER PRESS STARTUP	1	LS LS DAY	270,000 47,000 500			MODEL SS-A J-PRESS, 15 CU FT	
GRANULAR MEDIA FILTER	1	LS	48,000	48,000		AVERAGE PRICE OF TWO SYSTEMS	
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS	1	LS LS	12,000 41,000	12,000 41,000		·	
RETROFIT EXPENSES	1	LS	20,000	20,000			
SUBTOTAL (TO NEAREST \$1000)				!	\$643,000		
22:1:1888:1118:1118:1118:111		2222	*******			; = **************	á

PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS KESTRICTIONS WITH SOIL COVER. LEACHATE COLLECTION AND TREATMENT

	: QUANTITY			TOTAL		ASSUMPTIONS
DIRECT GPERATION AND MAINTENANCE COSTS						
1. MONITORING (\$/SAMPLING ROUND)				FIRST FIVE YEARS	AFTER FIVE YEARS	QUARTERLY FOR 1ST 5 YRS SEMI-ANNUALLY THEREAFTER
MONITORING WELLS Labor for monitoring Wells Surface Mater	6 8	EA DAY EA EA	1400 1000 1400 1600	229,600 24,000 22,400 25,600	90,200 12,000 22,400 25,400	FOR GROUNDWATER, OTHERS SEMI-AMMUALLY S1100/WELL AFTER 5 YEARS 11 E1, 2 TECH S 6 DAYS
SEDIMENT LABOR FOR SURFACE SAMP''S AIR QUALITY MONITORING FIELD BLANKS	i	DAY	600 700	1,200 1,400	1,200	Hnu, Ova - 1 E3, 1 TECH, 1 DAY , SEHI-ANNUALLY
GROUNDMATER SUBFACE MATER SEDIMENT DUPLICATES	2 1 1	EA EA EA	1400 1400 1600	11,200 2,800 3,200	4,400 2,800 3,200	#1100/MELL AFTER 5 YEARS
GROUNDWATER SUEFACE MATER SEDIMENT SHIPPING CHARGES	2 1 1 1	EA :	1400 1400 1600 2000	11,200 2,800 3,200 8,000	2,800 3,200	\$1109/WELL AFTER 5 YEARS 3 SAMPLES/COOLER - \$100/COOLER
2. TREATMENT PLANT OPERATION (\$/YEAR)				·	,	
TREATMENT SYSTEM FLOW RATE @ 40 GPM						
INFLUENT PUMPING ELECTRICITY	13100	kw-h	0.05	655		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHENICAL USAGE	6540 585 585	:TON :	0.05 45 80	327 26,305 46,800		ASSUME 30 % SOLIDS
FERROUS SULFATE ALKALT (LIME) POLYMER USAGE ACID USAGE	58 248456 350 -MINIMAL-	LB :	2.11 0.05 3.35	123 12,423 1,174		AS FERROUS SULFATE HEPTAHYDRIDE £ 2 PPM PERCOL 776
FACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	60000 177 177 177 130000	TON :	0.05 45 80 0.4	3,000 7,965 14,160 52,000		0.5 1b PAC/1b COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	65000	kw-h	0.05	3,250		
MAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24	:HR :	30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
3. COLLECTION SYSTEM (\$/YEAR)						
PUMP ELECTRICITY	1	LS	1000	1,000		
4. INSPECTION (\$/YEAR)						
SITE INSPECTION	1	LS	1800	3,600		1 E1, 1 TECH, 2 DAYS, TWICE PER YEAR
5. OTHER MAINTENANCE (\$/YEAR)						
LEACHATE COLLECTION PUMP REPLACEMENT REFURBISM WELL SCREENS	1	LS	500	500		REPLACE EVERY 5 YEARS
MONITORING WELLS CAP REPAIRS	:	: LS :	6000	6,000		CLEAN EVERY 10 YRS 2 MKS. LABOR, 2 PEOPLE
EROSION CONTROL FREEZE/THAW REPAIRS		AC :	225 225	16.650 16.650		

AFPENDIX TABLE A-3 PAGE 2

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS MESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	QUANTITY	TIMU	UNIT	TOTAL COST	ASSUMPTIONS	
DIRECT SPERATION AND MAINTENANCE COSTS						
SETTLEMENT REPAIRS FENCE MAINTENANCE	9400	CY	10 360ú	94,000 3,600	FILL 2" SETTLEMENT OVER SOX OF LANDFILL YEARLY	
NOWING CLEAN TILE SYSTEM LEACHATE COLLECTION SYSTEM		AC LF	670	49,580	CLEAN PIPELINE EVERY 5 YEARS	
		=====	z z zzzzzzz:			

NOTES:

 DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE IN RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

2. PACT CARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RCRA LANDFILL. IF REGULATIONS REDUIRE INCINERATION ADDITIONAL COSTS ARE ASSUMED TO BE \$10.50 /1b OF PACT CARBON SOLIDS COST (YEARS 1 TO 30): \$177.000 /YEAR

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 2: ACCESS RESTRICTIONS WITH SOIL COVER, LEACHATE COLLECTION AND TREATMENT

PRESENT WORTH (BASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAFITAL COST \$	ANNUAL ORM COST \$	DISCOUNT RATE	PRESENT WORTH	ANNUAL D & M COSTS:				
C	\$8,713,000			\$8,713,000	ANNUAL COSTS HONITORINS (8/SAMFLING ROUND)	FIRST	AFTER FIVE	TREATMENT PLANT OPERATION (\$7YR)	
3		\$1,081,000 \$1,081,000	0.82645 0.75131	\$893,392 \$812,166	MONITORING (#/SAMFLING ROUND)	YEARS	YEARS	TREATMENT SYSTEM FLOWRATE @ 40 GPM	
4 5		\$1,081,000 \$1,084,360	0.90909 0.82645 0.75131 0.68301 0.62092 0.56447 0.51316	\$952,392 \$812,166 \$738,334 \$673,301 \$514,797 \$468,002 \$425,457 \$386,779 \$355,221 \$319,647				INFLUENT PUMPING ELECTRICITY	655
6 7		\$912,000 \$912,000	0.56447 0.51316	\$514,797 \$468,002	MONITORING MELLS LABOR - MONITORING MELLS SURFACE MATER SEDIMENT LABOR - SURFACE SAMPLES AIR QUALITY MONITORING FIELD BLANES GROUNDMATER SURFACE MATER SEDIMENT DUPLICATES	229,600 24,000	90,200 12,000	PRECIPITATION SYSTEM	777
, B		\$912,000 \$912,000	0.4241	\$386,779	SEDIMENT	25,600	22,400 25,600	SLUDGE HAULING	26,305
10 11		\$921,360 \$912,000	0.51316 0.46451 0.4241 0.38554 0.35049 0.31863	\$305,221 \$319,647	EABOR - SURFACE SAMPLES AIR QUALITY MONITORING	1,200	1,200 1,400	: SLUDGE DISPUSAL : CHEMICAL USAGE	46,800
12 13	1	\$912,000	0.31863 0.28966	\$290.591 \$264.170 \$240,157 \$373,056	GROUNDWATER	11,200	4,400	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHEMICAL USAGE FERROUS SULFATE ALKAL] POLYMER	12,423
14 15	\$643,000	\$912,000 \$912,000 \$921,360 \$912,000 \$912,000 \$912,000 \$912,000 \$912,000	0.23939	\$373,056	SEDIMENT	3,200	2,800 3,200	PACT CYCTEM	1,1/4
16 !7		\$912,000 \$912,000	0.28946 0.26333 0.23939 0.21763 0.19784 0.17986	\$180,430	GROUNDWATER	11,200	4,400 2,800	PACT SYSTEM ELECTRICITY SDL19S HAULING SOL10S DISPOSAL CARBON USAGE	3,000
15 15		\$912,000 \$912,000	0.16351	\$149,121 \$149,121	GROUNDWATER SURFACE WATER SEDIMENT SHIPPING CHARGES	3,200 8,000	3,200 4,000	SOLIDS DISPOSAL	14,160
21 21		\$912,000 \$912,000	0.13513	\$123,239	SHIFTING CHANGES		,	i	32,000
23 24		\$912,000 \$912,000	0.11168 0.10153	\$101,852 \$92,595	\$/YR	\$347,000		AIR COMPRESSOR ELECTRICITY	3,250
17 18 19 19 19 19 19 20 20 20 20 20 20 20 20 20 20 20 20 20		\$915,360 \$912,000	0.0923 0.08391	\$84,488 \$76,526	SEDIMENT DUPLICATES GROUNDWATER SURFACE WATER SEDIMENT SHIPPING CHARGES \$/YR ANNUAL COSTS (SAME EVERY YEAR, \$/YR) INSPECTION GEN. MAINTENANCE			MAINTENANCE SUPERVISION MONITORING SAMPLE SHIFPING CHARGES	250,560 93,960
27 28		\$912,000 \$912,000	0.07628 0.06934	\$69,567 \$63,238				: MONITORING : SAMPLE SHIFPING CHARGES	33,600 : 2,400 :
29 30		\$912,000 \$921,360	0.06304 0.05731	\$57,492 \$52,803	ANNUAL COSTS (SAME EVERY YEAR, \$/YR)			TOTAL ANNUAL OPERATING COST	
TOTAL D	M PRESENT WORTH			\$9,247,000	INSPECTION GEN. MAINTENANCE CAP REPAIRS FENCE MAINTENANCE HOWING COLLECTION SYSTEM PUMP ELECTRICITY	3,600			
TOTAL R	EFLACEMENT PRESENT	I WORTH		\$154,000	FENCE MAINTENANCE	3,600			
TOTAL P	RESENT WORTH			\$18,114,000	COLLECTION SYSTEM	1 000		i 	
					TOTAL ANNUAL COSTS (\$/YEAR)				
NOTES:					NONANNUAL MAINTENANCE (\$/ACTIVITY)	*******			
i.	DISPOSAL OF PREC NO FIXATION OF T	CIPITATION SLUD THE SLUDGE ASSU	GE TO BE IN A RCR MED TO BE REQUIRE	A LANDFILL.	: MONITORING WELLS			<u> </u>	
2.						\$6,000			
	IS REQUIRED, THE CHAICH IS NOT IN	: ADDITIONAL PR ICLUDED) IS :	ESENT WORTH	\$1,669,000	LEACHATE COLLECTION SYSTEM PUMP REPLACEMENT (EVERY 5 YEARS)	#5 99			
	THE PRESENT WORT IN A RCRA LANDFI THE TOTAL PRESEN	IN OF THE FACT ILL, TO BE SUBT IT WORTH IS :	SOLIDS DISPOSAL RACTED FROM	\$133,000	CLEAN TILE SYSTEM (EVERY 5 YEARS) LEACHATE COLLECTION	\$2,860			

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PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS WITH RCAR CAP, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	QUANTITY	!UNIT	UNIT PRICE	TOTAL		
DIRECT CAPITAL COSTS		! !	! \$! !		
1. REMOVE CREEK AND LEACHATE SEDIMENT		ļ !	i !	1		
EXCANATE	4200	CY	8	33,600		
BACKFILL EXCAMATION I Material I Placement I	4000 4000	CY	10			ICLAY BACKFILL 1300' HAUL, 4" LIFTS, 4 PASSES
ESTABLISH VERETATIVE COVER SOIL	6800	1	! _	1		IONSITE TILL, EXCAVATE, HALL, BACKFILL
HYDROSEED I Subtotal i	61200) SF	0.03		\$129,000	IHYDRAULIC SPREADER
2. REROUTE FINLEY CREEK AND LINGUISED DITCH		į	!	!		4300 FT. REROUTED
EXCRÍPATE NEW CREEK BED		CY				ITILL, EXCAVATE AND HALL (MET)
SUBTOTAL I			! !	1	\$105,000	1
3. EDC SITE MONK !		İ	i I	i I	,	i !
REMOVE PROCESS BUILDING (Building Removal 4 Haul to disposal (108750 225	I I I CY	1 1 1 0.2 1 4.4			I ISINGLE BLDG, NO SALVAGE HIZ CY TAUDH, 0.5 WI R.T.
REMOVE CONTANINATED SLUDGE/SOIL 1 TESTING PRIOR TO EXCAVATION 1 EXCAVATE 1		LS	1 14000 3.4	1 1 14,000 1 6,205		i I I BACKHOE Excay, & Doubled for has
TRUCK LINERS I HRUL OFFSITE I	37	I EA	200	1 7,400		1225 NI HALL, 730 CY
DISPOSAL O RCRA FACILITY REMOVE EXTRACTED CONTAMINATED GROUNDWAY		CY		58,400		
HALL OFFSITE TREATMENT & ACRA FACILITY	9000 9000	IGAL IGAL	0.24 0.24			8450/TRUCK, 83.25/NILE, 225 NILES TO FACILITY TRUCK HANDLING AND TREATMENT
SUBTOTAL					\$144,000	
4. MONITORING PROGRAM			i			
MONITORING WELLS (11 - UPPER GLACIAL TILL (.220	LF	60	19,200		SHALLON – HOLLON STEM AUGER
13 - NID-DEPTH I 2 - DEEP SAND AND GROVEL I	490	1 LF	60		ļ	IDEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL!
PIEZOMETERS I 2 - UPPER GLACIAL TILL I	40	l LF	l I 60	l 2,400	Į.	SHALLON - HOLLON STEM AUGER
2 - MID-DEPTH t f subtotal i	10	l LF I	60	4,200	\$81,000	·
5. RCRA COP CONSTRUCTION			i I		1000	
PRELIMINARY GRADING		!				
FILL - EXCAVATE & HALL FILL - BACKFILL	213100 213100			11,278,600 639,300	ļ	USE ONSITE SOIL (COMMON EARTH)
DRAINAGE LAYER I EXCAVATE & HALL I	113000	CY	1	·	1	1.5 FT. THICK SAND AND GRAVEL, COMPACTED
BACKFILL I	113000	1 1	l i	339,000	ĺ	 2 FT. THICK, COMPACTED 1
EXCAVATE & HAUL BACKFILL	238000 238000	I CY I	3 1	12,380,000 714,000	[·
GEDTEXTILE I SYNTEHTIC MEMBRANE I	713000 356000		1.5	11,069,500		12 LAYERS OF POLYPROPYLENE (130 MIL. PVC (1
SAND LAYER EXCAMATE & HALL I	178000			1,424,000		ÚSE ONŠITE SOIL (COMMON EARTH)
BACKFILL ! ESTABLISH VEGETATIVE COVER !	178000	I CY I		534,000	!	! !

APPENDIX TABLE A-5 PAGE 2

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	QUANTITY	IUNIT				ASSUMPTIONS
DIRECT CAPITAL COSTS		i !	i ! !			
TOPSOIL HYDROSEED	119000 3207000		0.03			IONSITE TILL, EXCAVATE, HALL, AND BACKFILL IFESCUE, HYDRALLIC SPREADER
SUBTOTAL			1		\$10,614,000	
LEACHATE COLLECTION SYSTEM	25.0	!	! .	! !		I I I I I I I I I I I I I I I I I I I
EXCAVATE TRENCH LINE TRENCH	2540	ł	1 8	i 20,220		14' DEEP, & DOUBLED FOR H & S
PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BODXFILL SUMP/PUMP STATION WONFOLES		ŧ ÚF	I 15 I 4500	34,320 1 362,250		INETRIL, 8" DIA., 16 GAGE IIN TRENCH & UP SLOPE IFIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS IPRECAST CONC., 4' 10, 6' DEEP
SUBTOTAL			!		\$435,000	
LEACHATE TREATMENT		į	ŀ			IDESIGN NATE OF 40 GPM
INFLUENT PUMPING Egialization/Storage Pumps			100,000 6,600	100,000 13,200		1100,000 GALLON EQUALIZATION/STORAGE TANK ISURRERSIBLE PUMP
PRECIPITATION SYSTEM IM-LINE MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALIZATION TANK PILOT TESTINS STARTUP	1 1	ILS		47,000		IZ IN. IN-LINE MIXER INVERMEE PRICE OF THO SYSTEMS JJ-PRESS, 15 cu ft IFRP TROOK ISTEEL TROOK
PRCT SYSTEM PRCT PREVAGE FILTER PRESS PILOT TESTING STARTUP	1 1	ILS ILS ILS IDAY		47,000		i- INODEL 55-A IJ-PRESS, 15 cu ft
GRANLLAR MEDIA FILTER	1	LS	48,000	48,000		AVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING		LS LS		12,000 41,000 750,000		
SITE MORK SITE PREPARATION CLEARING GRADING	2200 6700	SY I	4 1	8, 800 6, 700		SITE AAEA: 300 FT X 200 FT, 1 FT DEPTH, 6 IN LEVEL
LEVELING (SITE DRAINAGE (EXCRYPTION (1100	1	3 t	3, 300 200		3 FT DEEP X 4 FT WIDE, 100 FT THENCH
PIPE I BACKFILL I	50 (100 (50 (LF I	4 6 6	600 300		
ACCESS ROAD :	450 I	1	21	900		20 FT WIDE BY 200 FT LONG
ROAD	450		15 i	6, 750		
SUBTOTAL :	į	i	i		1,426,000	
ACCESS RESTRICTIONS	i	i	i I		i	
FENCING I	9300	LF I	12 I 2000 I		İ	6' CHAIN LINK WITH BARBED WIRE

APPENDIX TABLE A-5 PAGE 3

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS WITH ACRA CAP, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	i QUANTITY	i UNIT	PRICE	TOTAL	COST	ASSUMPTIONS
DIRECT CAPITAL COSTS	 	 		 		
SIGNAGE	62	EA	33	2,046		1 SIGN EVERY 150 FT. ALONG FENCE
SUBTOTAL	į				\$118,000	į.
CONSTRUCTION SUBTOTAL					\$13,052,000	į
9. CUNTINGENCIES	ĺ			į		į
MOBILIZATION/BENOBILIZATION (5 %) HEALTH AND SAFETY (10 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (20 %)				653,000 11,305,000 11,958,000 12,610,000		
1 CONSTRUCTION TOTAL					\$19,578,000	į
10. OTHER	1 i					
PERMITTING (5 %) Services during construction				979,000 400,000		
TOTAL IMPLEMENTATION COST	į				\$20,957,000	
11. ENGINEERING						ļ
ENGINEERING DESIGN COST	 			450,000		
TOTAL CAPITAL COST	**************************************		100000	 	\$21,407,000	

APPENDIX TABLE A-6 PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS WITH RCRA CAP, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	OUANTITY	i IUNIT	I UNIT I PRICE	i total	COST	I ASSUMPTIONS
REPLACEMENT COSTS	i !		i 	i ! !		i ! !
1. TREATMENT PLANT	1			İ		REPLACEMENT AT YEAR 5, RE-USE MOST EQUIPMENT
Precipitation System In-Line Mixer Precipitation System Promage Startup	i i	IEA ILS IDAY	850 18,000 500	850 1 18,000 1 2,000		12 IN. IN-LINE MIXER IAVERAGE PRICE OF THO SYSTEMS
PACT System Pact padxage Startup		ILS IDAY	124,000 500	1 1 124,000 2,000		IMODEL 55-A
RETROFIT EXPENSES,	j 1	ILS	20,000	20,000		i
SUBTOTAL (TO NEAREST \$1000)	ĺ	į	İ	i I	\$167,000	i !
2. TREATMENT PLANT	į	į	j	İ		IREPLACEMENT AT YEAR 20, FLOWRATE OF 5 SPN
influent pumping Erualization/Storage Pumps		ILS IEA	100,000 6,600	100,000 13,200		1100,000 GALLON EQUALIZATION/STORAGE TANK ISURMERSIBLE PUND
PRECIPITATION SYSTEM IN-LINE MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STUMMEE TANK MEUTRALIZATION TANK STARTUP	! ! 1 1	IEA I ILS I ILS I ILS I ILS I	850 18,000 47,000 1,200 1,800 500	850 18,000 47,000 1,200 1,800 2,000		I 2 IN. IN-LINE MIXER IDAMERAGE PRICE OF TWO SYSTEMS IJ-PRESS, 15 CU FT IFRO TONK ISTEEL TANK
Pact System Pact Package Startup		LS I	124,000 500	124,000 2,000		NODEL 55-A
GRANLLAR MEDIA FILTER	ı	LS	23,000	23,000		INVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS		LS I	5,000 41,000	5,000 41,000		
RETROFIT EXPENSES	1	LS I	20,000	20,000		·
SUBTOTAL (TO NEAREST \$1000)			i !		\$399,000	I 1
3. ACRA CAP REPLACEMENT			ļ			REPLACEMENT AT 30 YEARS
DRAINAGE LAYER EXCRIMATE & HALL BACKFILL CLAY LAYER	113000 113000		8 i 3 i			I II.5 FT. THICK SAND AND GRAVEL, COMPACTED III.1 III.
EXCAMATE & HALL. BACKFILL	238000 238000		10 i			
GEOTEXTILE I SYNTEHTIC MEMBRONE I	713000 356000	SY I	1.5	1,069,500		2 LAYERS OF POLYPROPYLENE 1
SAND LAYER Excavate & Haul 1 Backfill 1	178000 178000 178000	CY	1.8 8 3	640,800 1,424,000 534,000		30 NTL. PVC 1 IUSE DNSITE SDIL (COMMON EARTH) 1
ESTABLISM VEGETATIVE COVER TOPSOIL HYDROSEED	119000 3207000	F	5 I 0.03 I	595, 000 96, 210	ļ	ONSITE TILL, EXCAMATE, HAUL, AND BACKFILL FESCUE, HYDRAULIC SPREADER
SUBTOTAL (TO MEAREST \$1000)			į		18 , 697, 000	
 :::::::::::::::::::::::::::::::::::	11 224 12771	====	 	**********	 25555555	

1 39**V**d

COMBINED ALTERNATIVE AMALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS MITH RCAR CAP, LEACHATE COLLECTION AND TREATMENT

2 FPM FEECOL 321 HE FEE THE FEET THE FE	;	158.1 181	\$0.0 50.0	: 87:	2105	POLYNER USAGE PLYALI (LINE)
301ROVNAT43H 374FAYD 2003R337 EA		520,5 520,5 720 720 720 720 720 720 720 720 720 720	: 50.0 : 20.0	100 100 100 100 100	89 89	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HALLING SLUDGE PASPESAL CHEMICAL USAGE FRANCUS SULTATION
	: :	191	20.0	4- 93	3270	INFLUENT FUMPING ELECTRICITY :
	1 1 1 1 1		:			- M90 2 9 312M RLDM RATE 9 5 6PM - 2 ABTER 5 YEAR
4 FULL TIME OPERATORS FULL TIME SUPERVISOR IMFLUENT AND EFFLUENT SAMPLE GWCE PER MONTH IMPRINTS PER MONTH	:	52,400 23,600 25,960 250,560	100 1400 42 20	: AH:	5¢ 5088 8022 8022	MAINTENANCE Supervision Monitoring Sanyle Shipfing Charges
	i 1 1 1	3,250	50.0	4-M 4	00059	OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY
ans alvand at 2.0		25,000 1,160 5,965 5,000	20.0 20 20 20 20	: NO1:	120000 111 111 10000	PACT SYSTEM SOLIDS HAULING SOLIDS HAULING SOLIDS USPOSAL CRABON USAGE
AS FERROUS SULFATE HEPTAHYDRIDE 4.7.6	;	12,411 12,411 17,411	2°22 0°02 5°11	: 87:	-WININGE- 220 548559 28	PCID NOVEE PERMEN NOVEE PERMEN NOVEE EEMENDIS ONLEVEE CHERICON
		25, 305 205, 305 46, 800	20.0 24 08	100 ; 100 ; 100 ; 100 ;	282	PRECIPITALION SYSTEM ELLECIRICITY SELECTRICITY SELECTRICITY SELECTRICITY SELECTRICITY PRESIDENT PRESIDENT SELECTRICITY SEL
		559	20.0	4-4 3	12100	INFLUENT PUMPING Electricity
			i ; ;			TREATHENT SYSTEM FLOM RATE 0 40 GPM - - FIRST 5 YEARS
			:			C. TREATHENT PLANT OPERATION (#/YEAR)
\$11000WELL AFTER 5 YEARS 3 SAMPLES/COOLER - \$100/COOLER	2*500 7:800	8,000 2,200 2,800 11,200	000Z 009I 009I 000I	57 V3 V3 V3	I I	CHILLING CHANGES CROINENT CROI
\$1100\MEFF WELEN 2 KEMES	:	2,200 2,800 11,200	1400 1400	EB EB	7	2.WA.18
7 E1, 1 TECH, 1 DAY , SEMI-AMMUNALLY 1 HDU, GV& - 1 E3, 1 TECH, 1 DAY , SEMI-AMMUNALLY	009:57 000:22	1,400 1,200 25,600 22,400	00/ 009 0091 0091	DAY EA EA	1 9 8	SURFACE WATER SEDIMENT LABOR FOR SUMFACE SAMPLES AND TON TON TON TON TON TON TON TON TON TON
QUBRTERLY FOR 157 5 YRS., SEMI-BMNUALLY THEREAFTER FOR GROUNDMATER, OTHERS SEMI-BMNUALLY \$1100/MELL WITER 5 YEARS 11 E1, 2 TECH'S 6 DRYS	90°500 60°500 15°000	229,600 24,600	1600 1400	43 YAG:		1. MONITORING (\$/SAMPLING ROUND) New Monitoring Wells Labor for Monitoring Wells
	. 9373A : 3V13 : 20A3Y	FIEST FIVE FIVE	; ; ;			
	1 1 1 1		T † † †			STECT OPERATION AND MAINTENANCE COSTS
2N0119MU22A				LIMN:	TITHAUG	DESCRIBLION

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE J: ACCESS RESTRICTIONS WITH RORA CAP, LEACHATE COLLECTION AND TREATMENT

SESCRIPTION	QUANTITY	: : UN! T	UNIT :	TOTAL CUST	ASSUMPTIONS
DIRECT OPERATION AND MAINTENANCE COSTS					
ACID USAGE	-MINIMAL-	LB			
PACT SYSTEM ELECTRICITY SCLIDS HAULING SDLIDS DISPOSAL CARBON USAGE		TON:		1,760	0.5 16 PAC/16 COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	33000	kw-h	0.05	1,650	
MAINTENANCE SUPERVISION HONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24	:HR :	30 45 1400 100	93,960 33,600	14 FULL TIME OPERATORS 1FULL TIME SUPER/ISOR 1NFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 12 SHIPMENTS PER MONTH
3. COLLECTION SYSTEM (\$/YEAR)					
PUMP ELECTRICITY	i	LS	1000	1,000	
4. INSPECTION (\$/YEAR)					
SITE INSPECTION	1	LS	1800	3,600	! E1, 1 TECH, 3 DAYS, TWICE PER YEAR
5. OTHER MAINTENANCE (\$/YEAR)					
LEACHATE COLLECTION PUMP REPLACEMENT REFURBISH WELL SCREENS	ì	LS	500	500	REPLACE PUMP EVERY 3 YEARS
MONITORING WELLS CAP REPAIRS	1	LS	6000	6,000	CLEAN EVERY 10 YRS 2 MKS. LABOR, 2 PEDPLE
EROSION CONTROL FREEZE/THAN REPAIRS SETTLEMENT REPAIRS FENCE HAINTENANCE HONING	74 9400 1	AC AC CY LS AC	225 10 3600	16,650 94,000 3,600	FILL 2° SETTLEMENT OVER 50% OF LANDFILL YEARLY &
CLEAN TILE SYSTEM LEACHATE COLLECTION SYSTEM	5720	LF	0.5	2,860	CLEAN PIPELINE EVERY 5 YEARS

NOTES:

DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE IN RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMEL TO BE REQUIRED.

2. PACT CARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RCRA LAMBFILL. IF REGULATIONS REQUIRE INCINERATION ADDITIONAL COSTS ARE ASSUMED TO BE \$0.50 /lb OF FACT CARBON SOLIDS COST (YEARS 1 TO 5): \$177,000 /YEAR COST (YEARS 1 TO 5): \$22,000

APPENDIT TABLE A-8 PASE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 3: ACCESS RESTRICTIONS WITH ACRA CAP, LEACHATE COLLECTION AND TREATMENT

PRESENT WORTH (BASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST \$	ANNUAL OWN COST \$	DISCOUNT RATE	PRESENT WORTH					
0 1 2 3 4	\$20,827,000	\$1,081,000 \$1,081,000 \$1,081,000 \$1,084,360 \$766,000	0.90909 0.82645 0.75131 0.68301 0.62092	\$20,827,000 \$982,726 \$893,392 \$812,166 \$738,334	ANNUAL COSTS MONITORING (\$/SAMPLING ROUND)	FIRST FIVE YEARS	AFTER FIVE YEARS		655
567.99 10	\$167,000	\$1,084,360 \$766,000 \$766,000 \$766,000 \$775,360 \$766,000	0.62092 0.56447 0.51316 0.46651 0.4241 0.38554	\$738,534 \$776,994 \$472,784 \$793,081 \$357,047 \$324,861 \$298,932	MONITORING WELLS LABOR - MONITORING WELLS SURFACE WATER SEDIMENT LABOR - SURFACE SAMPLES AIR QUALITY MONITORING	229,600 24,000 22,400 25,600 1,200 1,400	90,200 12,000 22,400 25,400 1,200	: ELECTRICITY : SLUDGE HAULING : SLUDGE DISPOSAL	327 25,305 46,800
11 12 13 14 15	•	\$766,000 \$766,000 \$766,000 \$769,360 \$762,000	0.28966 0.26333	\$268,475 \$244,671 \$221,886 \$201,711 \$184,177 \$166,705	: AIR QUALITY MONITORING : FIELD BLANKS : GROUNDMATER : SURFACE NATER : SEDIMENT : DUPLICATES	1,400 11,200 2,800 3,200	1,400 4,400 2,809 3,200	FERROUS SULFATE ALFALI POLYMER	123 12,411 1,174
17 18 19 20 21	\$399,000	\$766,000 \$766,000 \$766,000 \$775,360 \$766,000	0.19784 0.17986 0.16351 0.14864 0.13513	\$151,545 \$137,773 \$125,249 \$174,557 \$103,516 \$94,103	GROUNDWATER SURFACE WATER SEDIMENT SHIPPING CHARGES	11,200 2,800 3,100 8,000	4,400 2,800 3,200 4,000	SOLIOS MAULINA SOLIOS DISFOSAL CARBON USAGE AIR COMPRESSOR	7,965 14,160 52,000
11 12 14 15 16 17 18 19 21 22 24 27 28 29		\$765,000 \$766,000 \$766,000 \$769,360 \$766,000 \$764,000	0.11168 0.10153 0.0923 0.08391 0.07628	\$94,103 \$85,547 \$77,772 \$71,012 \$64,275 \$58,430 \$52,114	\$/YR	\$347,000	\$178,000	ELECTRICITY HAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	3,250 250,560 93,960 33,600 2,400
28 29 30	\$8,328,000	\$766,000 \$766,000 \$775,360	0.06934	\$50,114 \$48,289 \$521,714	ANNUAL COSTS (SAME EVERY YEAR, \$/YR) INSPECTION SEN. MAINTENANCE	3,600		OPERATING COST	\$549,000
	LM PRESENT WORTH EPLACEMENT PRESEN	T MUCTU		\$8,424,000 \$640,000	CAP REPAIRS FENCE MAINTENANCE MONING	127,300 3,600 49,58 0		TREATMENT SYSTEM FLOW RATE @ 5 GFM - AFTER 5 YEARS	
	RESENT WORTH	dukin		\$29,891,000	COLLECTION SYSTEM PUMP ELECTRICITY	1,000		INFLUENT PUMPING ELECTRICITY	154
NOTES:					TOTAL ANNUAL COSTS (\$/YEAR) NCNAMNUAL HAINTENANCE (\$/ACTIVITY)	\$185,000		PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL	327 3,055 5,440
1.	DISPOSAL OF PRE NO FIXATION OF	CIFITATION SLUI THE SLUDGE ASSI	DGE TO BE IN A RC JMED TO BE REQUIR	RA LANDFILL. ED.	MENITORING WELLS REFURBISH SCREENS (EVERY 10 YEARS)	16,000		: CHEMICAL USAGE : FERROUS SULFATE : ALKALÍ	15 1,551
2.	IF INCINERATION IS REQUIRED, THE WHICH IS NOT I	E ADDITIONAL PR	S AT \$ 0.50 / LB. RESENT WORTH	\$795,000	LEACHATE COLLECTION SYSTEM PUMP REPLACEMENT (EVERY 5 YEARS:			POLYMER FACT SYSTEM	147
	THE PRESENT NOR IN A RCRA LANDF THE TOTAL PRESEN	TH OF THE PACT ILL, TO BE SUBT NT WORTH IS:	SCLIDS DISPOSAL RACTED FROM	\$64, 000	CLEAN TILE SYSTEM (EVERY 5 YEARS) LEACHATE COLLECTION SYSTEM	\$2,860		ELECTRICITY SCLIDS HAULING SCLIDS DISPOSAL CARBON USAGE	1,300 970 1,740 6,570
					;			AIR COMPRESSOR ELECTRICITY	1.650
								MAINTENANCE SUFERVISION MONITOFING SAMPLE SHIFFING CHARGES	250,560 93,960 33,600 2,400
								OPERATING COST	\$403,000

AFPENDIX TABLE A-F

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SOIL COVER, GROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND ISCATHENT

DESCRIFTICH				UNIT FRICE		COST	ASSUMPTIONS
DIRECT CAPITAL COSTS							
. STABILIZE LANDFILL SURFACE							
PRELIMINARY GRADING Cut	53	500	CY	6	321,000		ITO PREVENT PONDING COMMON EARTH, EXCAVATE AND HAUL
FILL Excavate & Haul Backfill			CY	6	1,058,000 53 4, 000		TUSE ONSITE SOIL (COMMON EARTH), COMPACTED
RUN-OFF CONTROL DIICHING RIPRAF			CY :	. 5 74	10,560		DITCH 2 FT. WIDE, 3 FT. DEEP, 7020 FT. LONG
ESTABLISH VEGETATIVE COVER Soil Hydrogeed	:	1000	CY SF	5 0.63	595,000 96,210		: :ONSITE TILL, EXCAVATE, HAUL, BACKFILL :HYDRAULIC SPREADER
IMPROVE ACCESS ROADS COMFACT SUBGRADE	: 5	900	SY	2 2	19,800		:
GEOTEXTILE BASE GRAVEL CULVERT BELOW ROADS		900 : 300 :	SY :	2 8	19,800 26,400		112 OX. TREVIRA CRUSHED STONE SURBASE, 12"
EXCAVATE PIPE BACKFILL PIPE BECDING		34 239 27 230	CY :	7 11 11 2	1 297		IDITCH 2 FT. WIDE, 2 FT. DEEP 112" DIA., BITCH. COATED INVERT SAND BECKFILL
S	UBTOTAL				: :	\$2,825,000	
. REMOVE CREEK AND LEACHATE SEDIMENT							
EXEAVATE BACYFILL EXCAVATION	:	;	CY :	8	33,600		:EXCAVATE SAND & GRAVEL (WET)
MATERIAL FLACEMENT ESTABLISH VEGATATIVE COVER		000		10 5	40,000 20,000		:CLAY BACKFILL :300' HAUL, 4" LIFTS, 4 PASSES :
SOIL Hydroseed			CY :	0.03	34,000 1,836		IONSITE TILL, EICAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
5	UBTOTAL				: } !	\$129,000	
. REPOUTE FINLEY CREEK AND UNNAMED DITC	:			:			4300 FT. REROUTED
EXCAVATE NEW CREEK BED RIPRAP	; 3		CY :	20 74	65,100 39,960		ITILL, EXCAVATE AND HAUL (MET)
S	UBTOTAL				! ! !	\$165,060	
. ECC SITE WORK				:			
REMOVE FROCESS BUILDING BUILDING REMOVAL FOUNDATION DEMOLITION DISPOSAL	; 3	625	CF SF CY	0.2 3.3 3.7	21,750 11,963 1,332		: :SINGLE BLDG, NO SALVAGE :CONCRETE SLÅK, REINFOKCED I FOOT THICK :DEMOLISHED BUILDING VOLUME AND FON. VOLUME
RENOVE CONCRETE PAD DEMOLITION DISPOSAL		500 850	SF : CY :	3 3.7	91,500 3,145		: DEMOLISH CONCRETE PAD ASSUME 0.75 FEET THICK
REMÖVE CONTAMINATED SLUDGE/SOIL TESTING PRIOR IC EXCAVATION EXCAVATE TRUCK LINERS	;	1	LS : CY :	14000 3.4 200	14,000 6,205 7,490		BACKHOE EXCAN, & DOUBLED FOR HWS
HAUL OFFSITE DISPOSAL @ RCRA FACILITY	1	730 730	CY :	43 80	31,190 56,400		225 MI HAUL, 730 CY
IORƏ DƏTANIMATMOD CƏTDARTXƏ ƏVOMƏR ƏTIZƏTƏ IJAH YTIJIDAŞ ARDR 1 INƏMTAƏRI	; 9	000 6 000		0.14 0.24	7,150 2,150		: 14450/TRUSK, 43.15/MILE, 225 MILES TO FACILITY TRUCK HANDLING AND TREATMENT
Si	UBTOTAL :	;	1	,		1 251,000	

COMBINED ACTERNATIVE AMALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SOIL COVER, SROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

===		QUANTITY	UNIT		TOTAL		ASSUMPTIONS
	DIRECT CAPITAL COSTS	:			f 6 1 6		
5.	MONITORING FROGRAM				• • • •		
	MONITORING WELLS 11 - UPPER GLACIAL TILL 13 - MID-DEPTH 2 - DEEP SAND AND GRAVEL	320 490 350	LF LF LF	60 60 75	19,200 29,400 26,250		SHALLOW - HOLLOW STEM AUGER DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
	PIEZOMETERS 2 - UPPER GLACIAL TILL 2 - MID-DEPTH	40 70	LF LF	60 60	2,400 4,200		SHALLON - HOLLON STEM AUGER
	SUBTOTAL		!			\$81,000	,
٤.	GROUNDWATER INTERCEPTION AND COLLECTION	:			! !		
	EXTRACTION WELLS PLMPS COLLECTION PIPE CONNECTIONS		LF EA LF	60 265 4	9,600 1,590 3,040		B° DIA. WELLS, AIR ROTARY DRILLED 4° DIA. METAL
	CONNECTIONS TEES BENUS TRENCH FOR PIPE	225	EA EA CY	205 120 5	1,230 720 1,125		4° TEE, CORROSION RESISTANT 11/4 BEND, 4° DIA. 18/0 FT, LONG, 4 FT, HIDE, 2 FT, DEEP
	NIRING CONDUIT RECEPTACLES WIRE	1000 17 6000	LF EA LF	4 15 2	4,000 255 12,000		11.5" DIA. CONDUIT 1120 V., 15 AMP, GROUNGED 180 SIZE MIRE
	FRENCH DRAINS SHORING AND BRACING DEMATERING EXCAVATE TRENCH	26400 4 3910	: EA	1.4 440 4	36,960 1,760 15,640		HOOD SHEETING, WALES, BRACES, 12 FT X 4 FT X 2200 FT SUMP PUMPS DOUBLED FOR HEALTH AND SAFETY
	LINE TRENCH IMPERVIOUS MEMBRANE PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BACKFILL SUMP/PUMP STATIOM MANHOLES		{ SF { LF	0.2 0.17 6 15 4500 895	5,280 5,984 13,200 58,650 4,500 2,685		HETAL, B° DIA. 16 GAGE GRAVEL FILL, COMPACTED FIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS FRECAST CONC., 4° ID, 12° DEEP
	SUBTOTAL				• • •	\$178,000	
7.	LEACHATE COLLECTION SYSTEM						
	EXCAVATE TRENCH LINE TRENCH	2540	CY	8	20,320		4' DEEP, \$ DOUBLED FOR H & S
	PÉRVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BACKFILL SUMP/PUMP STATION MANHOLES		LF:	0.17 6 15 4500 650	34,320 362,230		METAL, 8° DIA., 16 GAGE IN TRENCH & UP SLOPE FIBERGLASS SUMF, INCLUDES PUMP(SIMFLEX) AND CONTROLS FRECAST CONC., 4° ID, 6 DEEP
	SUBTOTAL	:		,	• • •	\$435,000	
8.	GROUNDWATER COLLECTION - ECC						
	FRENCH DRAINS SOIL BORING PRIOR TO EXCAVATION SHORING AND BRACING DEMATERING EXCAVATE TRENCH FERVIOUS GEOTEXTILE FERFORATED PIPE GRAVEL BACKFILL COLLECTOR & RISER PIPE CONNECTIONS MET WELL SUMP PUMP	92000 4 13660 205200 4700 13600 1 1000 1 18	EA CY SF LF CY	36000 440 4 0.17 4 15 4 29 2300 2100	18.800 204,600 4.000 702		146 BORINGS ON 50 FT CENTERS 1/RENCH - 17' DEEP, 4' MIDE, 5400' LONG (TOTAL). NGOD SH 1/SUMP PUMPS THETAL, 4' DIA. 1/GRAVEL BACKFILL, COMPACTED 1/HETAL, 4' DIA. 1/TOTAL #) 1/FRECAS' CONC., MANHOLE, 6' 10, 16' DEEP

APPENDIX TABLE A-9 PAGE 3

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SOIL COVER, GROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

SESCRIPTION SESSIONAL SESS	CUANTITY	CUNIT		TOTAL		ASSUMPTIONS
DIRECT CAPITAL COSTS	t • •	:		 		
SUBTOTAL	• • • • •		! ! ! !	; ; ; ; ;	\$507,000	
9. GROUNDWATER/LEACHATE TREATMENT			:	: :		DESIGN RATE OF 138 SPM
INFLUENT FUMPING EQUALIZATION/STORAGE PUMPS	1 2		000,000 604,4	100,000 13,200		100,000 GALLON EQUALIZATION/STORASE TANK SUBMERSIBLE FUMP
PRECIPITATION SYSTEM IN-LIME MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALIZATION TANK FILOT TESTING STARTUP	1 1 1	LS LS LS LS LS LS	1,550 87,000 47,000 1,206 2,000 5,000 500	1,550 87,000 47,000 1,200 2,000 5,600 2,500		A IN. IN:LINE MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 cu it FRP TANN. STEEL TANK
PACT SYSTEM PACT PACKAGE FILTER PRESS PILOT TESTING STARTUP	1	LS	585,000 47,000 20,000 500	585,000 47,600 20,000 2,000		MODEL 55-A J-PRESS, 15 cu ft
GRAMULAR MEDIA FILTER	1	LS	55,000	55,000		AVERAGE PRICE OF THO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING		LS	16,000 41,000 25	16,000 41,000 750,000		
SITE MORK. SITE PREPARATION CLEARING GRADING LEVELING SITE DRAIMAGE EICAVATION PIPE BACKFILL ACCESS ROAD ROAD BASE ROAD	2200 6700 1100 50 100 50 450	SY CY CY LF CY		8,800 6,700 3,300 200 600 300 900 6,750		SITE AREA: 300 FT X 200 FT, 1 FT DEPTH, 6 IN LEVEL 3 FT DEEP X 4 FT WIDE, 100 FT TRENCH 20 FT WIDE BY 200 FT LONG
SUPTOTAL		:		: :	\$1,803,000	
10. ACCESS RESTRICTIONS	!	:		1		
FENCING Sate	9300	LF EA	12 2000	111,600 4,600		6' CHAIN LINE WITH BARBED WIRE
SIGNAGE		ĒĀ	32	2,046		1 SIGN EVERY 150 FT. ALONG FENCE
SUBTOTAL					\$119,000	
LUNSTRUCTION SUBTOTAL				! !	\$6,432,000	
11. CONTINGENCIES		:	:			
MOBILIZATION/DEMOBILIZATION (5 %) HEALTH AND SAFETY (15 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (20 %)	: : : : :		1 1 1 1 4 2 1	322.000 965.000 965.000 1,186.000		
CONSTRUCTION TOTAL	:	:	: !	! !	19,970,000	
12. OTHER		i		•		i i

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SOLL COVER, EROCHOWATER INTERCEPTION/COLLECTION, LEACHARTE COLLECTION AND TREATHENT

	000,612,118	=======	:====== :	= ====		TOTAL CAPITAL 2017
***************************************	1-111111111111	900,002	;:====== ;	::==== 		ENGINEERING DESIGN COST
						12" ENRINEERING
	600,917,01					TOTAL IMPLEMENTATION COST
		999,981 256,066	1			PERMITTING (5 %) SERVICES DURING CONSTRUCTION
						CIORS THIS WAS LETTER
	· ·					DIRECT CAPITAL COSTS
2M0119MU22A	1500	JA121	: 33188 : 1182	IINN	YTTTMAUQ	DESCRIPTION

1 3064 01-A 3JAN XICM3496

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SCIL COVER, GROUNDMATER INTERCEPTION AND LEACHAIR COLLECTION AND TREATMENT

,						
		000'0Z0'1\$				SUBTOTAL (TO NEAKEST \$1000)
		0 0 0*0Z	20,000	S٦	1	KETROF1T EXPENSES
		000*11 000*71	19*000	57 57	1	OTHER AIR CONPRESSOR INSTRUMENTATION AND CONTROLS
	SM3T2Y2 DWT 70 33189 38A83VA	22*000	000155	S٦	1	BRANULAR MEDIA FILTER
	MODEL SS-A 13-PRESS, 15 CU FT	000 [†] Z85 000 [†] Z85	200 41,000 285,000	794 12 12 12	1 :	M31272 TJA9 36A7JA9 TJA9 22AR P31111 9UFA8T2
	O IN. IN-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS TRAP TANK FRP TANK OF	002*1 000*2* 000*28	005,1 000,74 000,74 000,74	100 K 100 K		FRECIPITATION SYSTEM IN-LINE MILER PRECIPITATION SYSTEM PACKABE SOLIDS STORMEE TANK NEUTHER PRECIPITATION TANK NEUTHER PRECIPITATION TANK NEUTHER PRECIPITATION TANK NEUTHER PRECIPITATION TANK NEUTHER PRECIPITATION TANK NEUTHER PRECIPITATION TANK
	100,001 GALLON EQUALITATION/STORAGE YAWK SUBMERSIBLE PUNY	12*500 100*000	009'9 000'001	₹3 51	7	INFLUENT PUMPING Echallation/Storage Punf
	REFLACEMENT AT YEAR 15, FLOWRATE OF 138 GPM					1. TREATMENT PLANT
						21200 THEMENALMEN
	2MOI19MU2SA	1203 JA101	11NU 13189	TIMU	YTIIMAUG	M0:1913330

REPLACE ALL PUMPS EVERY 3 YEARS REPLACE EVERY 5 YEARS REPLACE EVERY 5 YEARS	;	228,1 000,1 001,2	0012 009 0001 0001	A3 A3 A3 A3	Ī	GROUMOWATERLEGORY EXTRACTION WELL PUMP REPLACEMENT LEACHATE COLLECTION PUMP REPLACEMENT GROUMOWATER COLLECTION PUMP SEPLACEMENT REFURBISH WELL SCREENS	
							٠.ς
I EI, I TECH, 2 DAYS, TWICE PER YEAR	1	00912	1800	57	1	SILE INSPECTION	-
QUARTERLY FOR 151 5 YRS., SENI-ANNUALLY THEREAFTER	:		!			[MSPECT]ON (\$/YEAR)	٠,
		1'000 720 5'000	0001 059 000Z	\$1 \$1 \$1	i i	GROUMDWATER INTERCEPTION SYSTEM EROUMDWATER COLLECTION SYSTEM LEACHATE COLLECTION SYSTEM	
	: :		1			PUMP ELECTRICITY (\$/YEAR)	3°
4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE DNCE PER MONTH 2 SHIFMENTS PER MONTH	:	5'400 22'900 42'490 520'290	100 1400 42 30	EV :	24 24 2088 8222	ZOMETE SHIPPING CHARGES Supervioring Maintenance Maintenance	
		8,200	20.0	4-43	000091	DTHER EQUIPMENT - ELECTRICITY	
0.5 1b PAC/1b COD		22,918 16,320 9,180 28,500	20.0 24 08 4.0	: NOT:	126462 504 504 110000	CARBON USAGE SOLIDS DISPOSAL SOLIDS HANKING ELECTRICITY PACI SYSTEM	
AS FERROUS SULFATE HEPTANYDRIDE 3 PERCOL 175	;	710, P 710, P 710, P	2.11 2.15 2.11	: 01: : 01:	-HIMINUF- 1508 428284 113	CHENICAL UGAGE FERROUS SULFATE ALKALI (LIME) POLYMER USABE ACID USABE	
VERANNE 20 % ROFIDR		42,855 45,855 45,855	50.0 21 20.0		1016 1016 92 4 0	PER CIPITAL LEGEN SELDER HAULTING SELDER CITY PRECIPITAL LEGEN PRECIPITAL	
		086	20.0	4- 83	00961	IMELUENT PUMPING ELECTRICITY	
						18ERTHENT SYSTEM FLOW RATE & 138 GPM	
						TREATMENT PLANT OPERATION (\$/YEAR)	3,
2 EMMFES/COOFER - \$100/COOFER \$1100/MEFF VEJEK I KEMK	000'\$ 008'Z 008'Z 008'V	8,000 2,200 2,800 1,200	000Z 009I 00#I	FR EV EV		GEGUNGARIER SURFACE MATER SEDINENT SHIPPING CHARGES	
\$1100/WELL AFTER I YEAR	2,200 2,800	2,200 2,800 11,200	0091 0091 0091	EV	1	GUPLICATER Scuineat Groundaater Groundaater Groundaater	
1 €1, 1 TECH, 1 DAY , SEMI-ANNUALLY MAU, OV≥ - 1 €3, 1 TECH, 1 DAY , SEMI-ANNUALLY	002 1 009 SZ	000 1 1 200 1 2 7 000 1 2 7 000	00/ 0091 0091	43 740 24		SURFACE NATER SEDINEW! LABGAF FOR SURFACE SAMPLES AIR QUALITY MONITORING FIELD BLANKS	
QUARTERLY FOR IST YR, SEMI-AMMUALLY THEREAFTER FOR GROUNDMATER, OTHERS SEMI-AMMUALLY \$1400/OTR FIRST YEAR, 1 E1, 2 TECH'S 6 DAYS	20°810 20°800	22,400 24,000 229,600	1000 1400	EA YAG	9 :	LABOR FOR MONITORING WELLS Nonitoring Wells	٠,
	8317A 12817 78817	12817 8 43 7	: : : :				
			:		,	STRECT OFERRISM AND MAINTENANCE COSTS	
SN0114MU22A			11M1 PRICE	ITNO	YTITMAU9 ;	DESCRIPTION	==

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 4: ACCESS RESTRICTIONS WITH SOIL COVER, GROUNDWATER INTERCEFTION/COLLECTION, LEACHATE COLLECTION AND TREATHENT

HEYENUIX TABLE A-11

SCHEINED ALTERNATIVE ANALYSIS - ALTERNATIVE A: ACCESS RESTRICTIONS WITH SOLL COVER, GROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

- 1						2400	GROUNDMATER COLLECTION SYSTEM-ECC
- ;						2200	ERDUNDARTER INTERCEPTION SYSTEM
- :		09	19°Z :	2.0	: 37 ;	2720	LEACHATE COLLECTION SYSTEM
:	CLEAN PIPELINE EVERY 5 YEARS				: :		CLEGIK TILE SYSTEM
;	1		IS'60 :		: 34 :	* /	: HOM INC
- :	;	00	3,6	0092	: 57 :	: 1	FENCE MAINTENANCE
;	SELECT 2" SETTLEMENT DVER SOX OF CANDELLLE YEARLY	00	0'16 :	01	: 13 :	0016	ZELITEMENI WENDINZ
		69	9.91	522	: 39 :	11	FREEZE/THAM REPAIRS
- 1	•	ήc			: 36 :	1 17	EKOSTOM CONTROL
•				303		**	CAP REPAIRS
	CCLEAN EVERY 10 YRS 1 MK, LABOR, 2 PEOPLE	6.0	00'2	2000	51	ı	COFFECTION SYSTEM MELLS
	CLEAN EVERY 10 YRS 2 WLS. LABOR, 2 PEOFLE	00			51		MONITORING WELLS
- ;	1 CON CHEEV TO WOL 2 IN C 10 AD 12 I	00	" '	7007	; - ' ;		, arigottaga
- ;	;		;		; ;		, ,
:	, ,		;		: ;	;	DIRECT DRERATION AND MAINTENANCE COSTS
;	;				:	!	1 21207 374. M31416M AM1 W011A0367 173617
:						!	
- 1	TITLE TO DESCRIPTION TO DESCRIPTIO						
- 1	SNOTTEMESSA	1203 14	1101		TOME	YEITMAUQ	NOTTATADS30
- ;	;		1	TIND	;	i	

APPENDIX TABLE A-11

COST INERRS I 10 30): \$204 CON TARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RCAR LANDFILL. IF REGULATIONS REQUIRE INCINERATION ADDITIONAL COSTS ARE ASSUMED TO BE \$20.50 /1b OF PACT CARBON SOLIDS \$20.5

1. DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE TH RCRA LANDFILL.

NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

7

COMBINED ALTERNATIVE ANALYSIS - APPENNATIVE 4: ACCESS RESTRICTIONS WITH SDIL COVER, GROWNCHATER INTERCEPTION/COLLECTION AND LEACHATE COLLECTION AND TREATMENT

FRESENT WORTH (EASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST #	ANNUAL OWN COST #	DISCOUNT RATE	PRESENT WORTH	ANNUAL O & M COSTS:				
0	\$11,219,000			\$11,219,000	ANNUAL COSTS	FIRST	AFTER	TREATMENT PLANT OFERATION (\$/YR)	
1		\$1,199,000 \$970,000 \$971,855 \$970,000 \$980,260 \$971,855 \$970,000	0.90909 0.82645	\$1,089,999 \$801,65?	ANNUAL COSTS HONITORING (\$/SAMPLING ROUND)	YEAR	FIRST Year	: TREATMENT SYSTEM FLOW RATE @ 138 GPM	
74 5 67		\$970,000	0.75151 0.68301	\$652,520	j			INFLUENT PUMPING ELECTRICITY	
5		\$980,260 \$971,855	0.68301 0.62092 0.56447	#662,520 #608,663 #548,583 #497,765	MONITORING WELLS LABOR - MONITORING WELLS SURFACE WATER SEDIMENT LABOR - SUPFACE SAMPLES AIR QUALITY MONITORING FIELD BLANKS ERDUNDWATER SURFACE WATER	229,660	30,800	:	980
? 8		\$970,000 \$970,000	0.51316 0.46651	\$497,765 \$452,515	LABOR - MONITORING WELLS SURFACE MATER	24,000 22,400	12,000	TI FETELPITY	327
9		\$970,000 \$971,855 \$988,260	0.46651 0.4241 0.38554	\$452,515 \$412,164 \$381,014	SEDIMENT	25,600	22,400 25,600 1,200	: SLUDGE HAULING	45,855 81,520
10 11		\$970,000	0.35049	\$339,975 \$309,662	: AIR QUALITY MONITORING	1,400	1,400	CHEMICAL USAGE	
12	•	\$970,000 \$971,855 \$970,000	0.31843 0.28966	\$309,662 \$280.970	FIELD BLANKS GROUNDWATER	11.200	4,400	CHEMICAL USAGE FERROUS SULFATE ALKALI	246 21,970
14	#1 670 000	\$970,000 \$982,115	0.24333 0.23939	\$280,970 \$255,430 \$479,286	SURFACE WATER SEDIMENT	11,200 2, 80 0 3,200	2,800 3,200	POLYNER	4,047
16	\$1,020,000	\$970,000	0.21763	\$211,101	: UIPCICATES			PACT SYSTEM	
17 18		\$970,000 \$971,855	0.19784 0.17986	\$191,905 \$174,798	GROUNDMATER SURFACE WATER SEDIMENT	11,200 2,800	4,400 2,800	: ELECTRICITY : SOLIDS HAULING	38,500 9,180
19		\$971,855 \$970,000	0.17986 0.16351 0.14864	\$158,605 \$146,895	SEDIMENT SHIPPING CHARGES	2,900 3,200 8,000	3,200 4,000	SOLIDS DISPOSAL	16,320 55,918
21		\$988,260 \$971,855 \$970,000	0.13513 0.12285	\$131,327	SUIFFE CHARGES	0,000	4,000	i	22,115
11 12 13 14 15 16 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 18 18 18 18 18 18 18 18 18 18 18 18		\$970.000	0.11168	\$119,165 \$10 8 ,330	\$/YR	\$347,000	\$118,000	: AIR COMPRESSOR : ELECTRICITY	B,200
24 25		\$971,855 \$980,260	0.10153	\$98,672 \$90,478			·	; : Maintenance	250, 540
26		\$970,000 \$971,855	0.0923 0.08391	\$81.393				SUPERVISION	250,560 93,960 33,600
2B		\$970,000	0.07628 0.06934	\$74,133 \$67,260				: MONITORING : SAMPLE SHIPPING CHARGES	2,400
29 30		\$970,000 \$990,115	0.06934 0.06304 0.05731	\$67,260 \$61,149 \$56,743	ANNUAL COSTS (SAME EVERY YEAR, \$/YR)			: : TOTAL ANNUAL OPERATING COST	\$664,000
TAL D	M PRESENT WORTH	·		\$9,378,000	: GEM. MAINTENANCE	3,600		<u> </u>	
OTAL R	EPLACEMENT PRESENT	WORTH		\$244,000	GEM. MAINTENANCE CAF REPAIRS FENCE HAINTENANCE	127,300 3,400 49,580			
	RESENT WORTH				: MONING	49,580			
INC I	NEGERI WORTH			*20,041,000	PUMP ELECTRICITY GROUNDWATER INTERCEPTION GROUNDWATER COLLECTION - ECC LEACHATE COLLECTION	2,000			
					: EROUNDWATER COLLECTION - ECC : LEACHATE COLLECTION	1,000		1	
TES:					TOTAL ANNUAL COSTS (\$/YEAR)	\$188,000			
1.	DISPOSAL OF PREC	IPITATION SLUC	GE TO BE IN A RE	RA LANDFILL.	NONANNUAL MAINTENANCE (\$/ACTIVITY)			1 1 1	
_					REFURBISH SCREENS (EVERY 10 YEARS)				
2.	IF INCINERATION IS REQUIRED, THE	UF PALT SULIDS ADDITIONAL PR	S AT \$ 0.50 / LB. RESENT WORTH	\$1,923,000		\$6,000 \$2,000			
	CHAICH IS NOT IN	ICLUDED) 15 :		\$1,923,000	GROUNDNATER / LEATHATE COLLECTION	• • •		•	
	THE PRESENT MORT	H OF THE PACT	SOLIDS DISPOSAL		FURP REPLACEMENT	41 055		· 	
	THE TOTAL PRESEN	IL, IU BE SUBT IT WORTH IS:	MALIED FRUM	\$154,000	: EXTRACTION WELL TEVERY 5 YEARS) : FRENCH DRAIN (EVERY 5 YEARS)	\$1,000		•	
		·		,	: LEACHATE COLLECTION (EVERY 5 YEARS) : GROUNDMATER COLLECT-FCC (EVERY 5 YES)	\$500 \$2,100			
					ELEAN TILE SYSTEM (EVERY 5 YEARS)	*2 010			
					GROUNDWATER INTERCET ON CONTROL FUNP REPLACEMENT EXTRACTION WELL (EVERY 3 YEARS) FRENCH DRAIN (EVERY 5 YEARS) LEGOLAGE COLLECTION (EVERY 5 YEARS) GROUNDWATER COLLECT-ECC (EVERY 5 YEARS) LEAN TILE SYSTEM (EVERY 5 YEARS) LEGOLAGE COLLECTION SYSTEM GROUNDWATER COLLECTION - ECC	\$2,860 \$1,100		i !	
					GROUNDWATER COLLECTION - ECC	\$2,700	_	, ,	

APPENDIX TABLE A-10 PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE S: ACCESS RESTRICTIONS WITH FORA CAP, MODIFIED GROUNDWATER INTERCEFTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

:::	DESCRIFTION	: QUANTITY	: :UNIT	UNIT FRICE	: 10141		ASSUMPTIONS
	DIRECT CAPITAL COSTS			· · · · · · · · · · · · · · · · · · ·	:		
2.	REMOVE CREEK AND LEACHATE SEDIMENT EXCAVATE BACKFILL EXCAVATION MATERIAL PLACEMENT ESTABLISH VEGETATIVE COVER SOIL HYDROSEED SUBTOTAL RERDUTE FINLEY CREEK AND UNNMAED DITCH EXCAVATE NEW CREEK BED RIPRAP	4200 4000 4000 61290 3255 540	EY EY EY CY SF	8 10 5 0.03 20 74	73,600 40,000 20,000 34,000 1,836 65,100 39,960	\$129,600	CLAY BACKFILL 100 HAUE, 4° LIFTS, 4 PASSES OMSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER 4300 FT. REROUTED TILL, EXCAVATE AND HAUL (MET)
7.	SUBTOTAL ECC SITE WORK		:	1	!	\$105,000	
	REMOVE PROCESS BUILDING BUILDING REMOVAL FOUNDATION DEMOLITION DISPOSAL REMOVE CONCRETE PAD BENCLITION DISPOSAL TESTING PRIDE TO EXCAVATION EXCAVE CONTAMINATED SLUDGE/SOIL TESTING PRIDE TO EXCAVATION EXCAVE TRUCK LINERS HAUL DEFSITE DISPOSAL & RCKA FACILITY REMOVE EXTRACTED CONTAMINATED GROUNDMA HAUL DEFSITE TREATMENT & RCRA FACILITY SUPTOTAL	360 30500 650 1 1625 37 730 730	SF CY SF CY	0.2 3.3 3.7 14000 3.4 200 4.3 80 0.24 0.24	21,750 11,763 1,332 91,500 3,145 14,000 6,205 7,400 31,390 58,400 2,160 2,160		SINGLE BLDG, NO SALVAGE CONCRETE SLAB, REINFORCED I FOOT THICK DEMOLISHED BUILDING VOLUME AND FON. VOLUME DEMOLISH CONCRETE PAD ASSUME 0.75 FEET THICK BACKHOE EXCAV, & DOUBLED FOR H&S 225 MI HAUL, 730 CY \$450/TRUCK, \$3.25/MILE, 225 MILES TO FACILITY TRUCK HANDLING AND TREATMENT
4.	MONITORING PROGRAM MONITORING WELLS	! ! !	1	! ! ! !	:		
	11 - UPPER BLACIAL TILL 13 - MID-DEPTH 2 - DEEP SAND AND GRAVEL PIEZOMETERS 2 - UPPER BLACIA TILL 2 - MID-DEPTH SURTOTAL	320 490 350 40 70	LF LF LF	60 60 75 60 60	19,200 29,400 26,250 2,400 4,200		SHALLOW - HOLLOW STEM AUGER DEEP, DOUBLE CASING. TILL WELL ADJACENT TO N. DEEP WELL SHALLOW - HOLLOW STEM AUGER
٤.	RERA CAP CONSTRUCTION				; ;		
	PRELIMINARY GRADING FILL - EXCAVATE & HAUL FILL - BACKFILL DRAINAGE LAYER EXCAVATE & HAUL BACKFILL CLAY LAYER EXCAVATE & HAUL BACKFILL GEOTEXTILE SYNTEHTIC MEMBRANE	113000	CY CY CY CY CY	3 8 3 10 3 1.5	1,278,690 539,399 904,096 339,090 2,470,000 741,060 1,110,000 565,000		USE ONSITE SOIL (COMMON EARTH) 1.5 FT. THICK SAND AND GRAVEL, COMPACTED 2 FT. THICK, COMPACTED 2 LAYERS OF POLYPROPYLENE 30 MIL. PLC

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 5: ACCESS RESTRICTIONS WITH REPAICAF, MODIFIED GROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	YITTHAUC			: : TOTAL	CCS1	ASSUMFTIONS
DIRECT CAPITAL COSTS	!	}				
SAND LAYER EXCAVATE & HAUL BACKTILL ESTABLISH VEGETATIVE COVER	185000 185000	CY	8 3	1,480,000 555,000		USE ONSITE SOIL (COMMON EARTH)
SOIL HYDROSEED	124000 3329600	CY SF	5 (0.03	620,000 99,870		I FT. THICK, IMPORTED SOIL FESCUE, HYDRAULIC SPREADER
SUBTOTAL				:	\$10,903,000	
4. GROUNDWATER INTERCEPTION AND COLLECTION	•	}				
FRENCH DRAINS SHORING AND BRACING DEMATERING EXCAVATE TRENCH	62000 4 9200	SF EA CY	605 4	124,000 2,420 36,800		MODD SHEETING, MALES, BRACES, 12 FT X 4 FT X 2200 FT SUMP PUMPS
LINE TRENCH IMPERVIOUS MEMBRANE PERVIOUS GEOTEXTILE	62000 75000	SF SF	0.2 0.17	12,400 12,750		
CLAY MALL LIMER EXCAVATE AND MAUL BACKFILL PERFORATED PIPE SKAYEL BACKFILL SUMP/PUMP STATION MANHALES	450 6100 9200	CY CY LF CY EA	10 3 6 15 4500 1902	4,500 1,350 36,600 138,000 4,500 9,510		METAL, 8° DIA., 16 GAGE SGRAYEL FILL, COMPACTED FIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS PRECAST CONC., 4° ID, 25° DEEP
SUBTOTAL	; ; ;				\$383,000	
7. LEACHATE COLLECTION SYSTEM						
EXCAVATE TRENCH LINE TRENCH	2540	CY	8	20,320		4' DEEP, \$ DOUBLED FOR H & S
PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BACKFILL SUMP/PUMP STATION MANHOLES	62900 5720 24150 1 5	SF LF CY EA	9.17 6 15 4590 650	10,693 34,320 362,250 4,500 3,250		METAL, 8° DIA., 16 GAGE INTTRENCH & UP'SLOPE IFIBERGLASS SUMP, INCLUDES FUMP(SIMPLEX) AND CONTROLS IPRECAST COMC., 4° ID, 6° DEEP
SUBTOTAL	i ! !) 	\$435,000	
8. GROUNDWATER/LEACHATE TREATMENT	i 1 5 8			1 1 1 1		DESIGN RATE OF 101 GPM, DROPS TO 66 GPM AFTER 5 YEARS. EQUIPMENT SIZE REMAINS THE SAME.
INFLUENT PUMPING EQUALIZATION/STORAGE PUMPS		LS EA	00,000 6,600	100,000 15,200		100,000 GALLON EQUALIZATION/STORAGE TANK SUBMERSIBLE PUMP
PRECIPITATION SYSTEM IN-LIME HIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALIZATION TANK PILOT TESTING STARTUP	1 1 1	EA LS LS LS LS LS	1,550 87,000 47,000 1,200 2,200 5,000	1,550 87,000 47,000 1,200 2,200 5,000 2,500		4 IN. IN-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 cu ft FRP TANK STEEL TANK
PACT SYSTEM PACT FACEAGE FILTER PRESS PILOT TESTING STARTUP	1	LS LS LS	585,000 47,000 20,000 500	585.000 47,000 20,000 2,000		HODEL 55-A J-FRESS. 15 cu ft
GRANULAR MEDIA FILTER	1	LS	55,000	55,000		AVERAGE PRICE OF TWO SYSTEMS
DTHER		:				i i

APPENDIX TABLE A-13 PAGE 3

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 5: ACCESS FESTRICTIONS WITH RCRA CAP, MODIFIED GROUNDWAYER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

7222	DESCR!PTION	QUANTITY		UNIT PRICE	TOTAL		ASSUMPTIONS
	DIRECT CAPITAL COSTS			! !			
	AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING	1 30600	ILS	16,000 41,600 25	16,000 41,000 750,000		
	SITE WORK SITE PREPARATION CLEARING GRADING LEVELING	2200 6700 1100	:SY	4 1 3	8,800 6,700 3,300		SITE AREA: 300 FT I 200 FT, 1 FT DEPTH, 6 IN LEVEL
	SITE DRAINAGE EXCAVATION PIPE BACKFILL ACLESS ROAD	100 50	CY	6	200 600 300		13 FT DEEP X 4 FT WIDE, 100 FT TRENCH 120 FT WIDE BY 200 FT LONG
	ROAD BASE Road	450 450	SY	15	900 6,750		
	SUBTOTAL	! !	į			\$1,803,000	
9.	ACCESS RESTRICTIONS				İ		
	FENCING	9300		12	111,600		6' CHAIN LINK WITH BARBED WIRE
	GATE SIGNAGE		EA :		4,000 2,046		1 SIGN EVERY 150 FT. ALDNE FENCE
	SUBTOTAL	i !				\$118,000	
	CONSTRUCTION SUBTOTAL	; ;			•	\$14,208,000	
10.	CONTINGENCIES				:		.
	MOBILIZATION/DEMOBILIZATION (5 %) HEALTH AND SAFETY (15 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (25 %)			:	710,000 2,131,000 12,131,000 12,131,000 3,552,000		Ĺ
	CONSTRUCTION TOTAL					\$22,732,000	
11.	OTHER						
	PERMITTING (5 %) Services during construction				1,137,000 450,000		
	TOTAL IMPLEMENTATION COST					\$24,319,000	
12.	ENGINEERING '				:		
	ENGINEERING DESIGN COST				550,000		
	TOTAL CAPITAL COST						
====		********	{====	=======		***********	

AFFENDIK TABLE A-14

COMBINED PALERMATIVE ANALYSIS - ALTERMATIVE 5: ACCESS RESTRICTIONS WITH RCRA CAP, NODIFIED BROUNDMATER INTERCEPTION AND LEACHAIR COLLECTION AND TREATMENT

	***************************************	************	**********		====	======================================	=======================================
		000,289,81					(0001\$ 123AAAW 0T) JATOTGUZ
	HYDRAULIC SPREADER, HAUL, BACKFILL		028,66 000,024	50.0	JS.		HADBOOREED 2017
	AND THE EVEN AND BEAUTIES AND BACKETES		222*000	2	נג		BACHTLL ESTABLISH VEGETATIVE COVER
	INSE DUSTIE SOIL (COMMON EARTH)		000,081,1	à	ίĬ		SAND LAYER HAUL
	2 LAVERS OF POLYPROPYLENE 30 MIL. PVC INCE DAUGH COLLA		000'999 000'011'1	8.1 8.1	¥5	210000 140000	SENTATION STATES TO SENTENCE STA
	THE DELIVERY CALL		000 1112	10	LA :	247000 247000	EXCAVATE & HAUL
	Z FT. THICK, COMPACTED		224,000	2	λJ	112000	CLAY LAYER BACKFILL
3	1.5 FT. THICK SAND AND BRAVEL, COMPACTED		904,000	8	۲J	112000	DRAINAGE LAYER Excavate & Haul
,	REPLACEMENT AT 30 YEARS						2. RCKA CAP REPLACEMENT
		000'070'1\$					SUBTRIAL (TO MERKEST \$1000)
			20,000	000°0Z	รา	1	RETROF11 EXPENSES
			000'11 000'91	000'11	\$1 \$1		OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS
	AVERAGE PRICE OF TWO SYSTEMS		92,000	22,000	51	1	GRANULAR MEBIA FILTER
	, WODEL 55-A 1FRESS, 15 CU FT		282*000 282*000	000,282 000,74 000 000,74	4 40 51 51	1 :	PACT SYSTEM PACT PACLABE FILIER PRESS STARTUP
	4 IN. IN-LINE HIXER AVERAGE PRICE OF THO SYSTEMS TRY TANK FRY TANK		5°000 5°500 1°500 40°000 80°000 1°220	005 002'Z 002'I 000'Lb 000'Lb	81 51 51 51 51 83	1	PRECIPITATION SYSTEM IN-LINE UNIEK PRECIPITATION SYSTEM PACKAGE FILTER PRESS RUCIFALIZATION TANK STARTUP
	MAT 38AROTZ\MOITAILAUA EQUALIZATON/STORAGE 19MK Submersirle Pump		100,000	000'001 000'001	¥3 57	7 1	INFLUENT PUMPING Edualization/Storage Pumps
	REPLACEMENT AT YEAR 15, FLOW DROPS TO 66 GPM AFTER 5 Years.						THERATMENT PLANT
							KEPLACEMENT COSTS
	SW01T3MUS2A		JA101 ===========	DNIT PRICE	TINU	YTITMAUQ	DESCRIPTION

1 3044

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 5: ACCESS FESTRICTIONS WITH MERA CAP, MODIFIED GROUNDWATER INTERCEPTION/COLECTION, LEACHATE COLLECTION AND TREA

	QUANTITY	IUNII	UNIT PRICE	TOTAL		ASSUMPTIONS
DIRECT OPERATION AND MAINTENANCE COSTS	- -	} :		<u>:</u>		
1. MONITORING (\$/SAMPLING ROUND)	: : : : :			FIRST YEAR	AFTER FIRST YEAR	DUARTERLY FOR 15T YR., SEMI-ANNUALLY THEREAFTER FGG GRGUNDWATER, OTHERS SEMI-ANNUALLY
MONITORING WELLS LABOR FOR MONITORING WELLS SURFACE MATER SEDIMENT LABOR FOR SURFACE SAMPLES AIR QUALITY MONITORING	8	EA DAY EA EA DAY	1400 1000 1400 1800 600 700	229,660 24,000 22,400 25,600 1,200 1,400	30,869 12,000 22,400 25,600 1,200	FEGE GEGINDWATER, OTHERS SEMI-ANNUALLY 14 WELLS RFTER FIRST YERR, \$1100/WELL 11 E1, 2 TECH 5 6 DAYS 11 E1, 1 TECH, 1 DAY, SEMI-ANNUALLY HAU, DVA - 1 E3, 1 TECH, 1 DAY, SEMI-ANNUALLY
FIELD BLANKS GROUNDWATER SURFACE MATER SEDIMENT DUPLICAJES	2	EA EA	1400 1400 1600	11.200 2,800 3,200	•	\$1100/WELL AFTER 1 YEAR
GROUNDMATER SURFACE WATER SEDIMENT SHIPPING CHARGES	1	EA EA EA LS	1400 1400 1600 2000	11,200 2,800 3,200 8,000	2,800 3,200	\$1100/MELL AFTER 1 YEAR 3 SAMPLES/COOLER - \$100/COOLER
2. TREATMENT PLANT OPERATION (\$/YEAR)						
TREATMENT SYSTEM FLOW RATE @ 101 GPM FIRST 5 YEARS				; ;		
INFLUENT PUMPING ELECTRICITY	19600	kw-h	0.05	78 0		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHEMICAL USAGE		ku-h TDN TON		327 38,745 68,880		
FERROUS SULFATE ALKALI (LIME) POLYMER USAGE ACID USAGE	369800 879 -MINIMAL-	:L8	2.11 0.05 3.35	169 18,490 2,945		AS FERROUS SULFATE HEPTANYDRIDE 2 PPM PERCOL 776
PACT SYSTEM ELECTRICITY SDLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	770000 193 193 193 136000	TON :	0.05 45 80 0.4	38,500 8,685 15,440 54,400		0.5 16 PAC/16 COD
OTHER EDUIPMENT AIR COMPRESSOR - ELECTRICITY	164000	ku-h	0.05	8,200		
NAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24	HR :	30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OFERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
TREATMENT SYSTEM FLOW RATE @ 66 GPM - - AFTER S YEARS	:					
INFLUENT PUMPING ELECTRICITY	19600	kw-h	0.05	980		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHEMICAL INSACE	6540 333 333	kw-h TON TON	0.05 45 90	327 14,985 26,840		
CHEMICAL USAGE FERROUS SULFATE ALKAL! (LIME) POLYMER USAGE	148300 573	LD :	2.11 9.95 3.75	70 7,415 1,720		AS FERROUS SULFATE HEFTAHYDRIDE 2 FPM PERCOL 776

COMBINED PALTERNATIVE ANALYSIS - ALTERNATIVE 5: ACCESS RESTRICTIONS WITH RCRA CAP, MODIFIED GROUNDWAIER INTERCEPTION/COLECTION, LEACHATE COLLECTION AND TREA

2 3904 21-A 3JSAT KIQN399A

SNC114MU22A		JA101	301%d NN11		Y111MAU9	DESCRIPTION
						DIRECT SPERATION AND MAINTENANCE COSTS
				81	-NININGE-	39A2U 010A
00.5 1b PAC/1b COD	(2,200 1,800 1,800 28,500	80	NOT:		PACT SYSTEM Sollos hauling Sollos pisposal Carbon usage
		002'8	20.0	4-#1	194000	OTHER EQUIPMENT - ELECTRICITY
4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIFMENTS PER MONTH	1	5*400 22*900 42*460 520*298	100 1400 42 20	: V3	74 74 7088 8222	AEINIEWENCE PONIJORING SUPERVISION PAINIEWENCE THIBLING
	(000'Z	1000 3000	51 51		LEACHAIE COLLECION SYSTEM GROUNDWAIER INTERCEPTION SYSTEM ELECTRICITY (\$/YEAR)
I EI, 1 TECH, 3 DAYS, TWICE PER YEAR	•	2*900	1800	\$1	1	INSPECTION (*/YEAR)
						OTHER MAINTEMANCE (\$/YEAR)
REPLACE EVERY 5 YEARS		200 1 000	200 1000	EV :		GROUMDMATER/LEACHATE COLLECTION French Drain Punp Replacenent Leachate Collection Punp Replacenent Leachate Collection Punp Replacenes
CLERN EVERY 10 YRS 1 MK. LABOR, 2 PEOPLE CLEAN EVERY 10 YRS 2 MKS. LABOR, 2 PEOPLE	1	000'Z	000Z 0009	\$1 \$1	1	STIRM MAISAS MOZIOSTTOS MONILOMINO METES BELTIBRISM METE SCHERNS
T FIFE 2. SETTLEMENT OVER SOX OF LANDFILL YEARLY	1	44,580 2,600 34,000 16,650 16,650	927 252 252 252 252	36 27 27 28 39 30	6400	CAP KEPAIKS EROCION CONTROL FREEZE/THAN REPAIRS FREEZE/THAN REPAIRS FREEZE/THAN REPAIRS FREEZE/THAN REPAIRS
; :CFEVM BIBETIME ENEBA 2 NEVB2	ı	098'2	2.0	17	2100	CLEAN TILE SYSTEM LEACHATE COLLECTION SYSTEM GROUNDWATER INTERCEPTION SYSTEM

2. PACT CARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RCRA LANDFILL. IT REGULATIONS REQUIRE INCINERATION COST (YEARS 1 10 5): \$193,000 /YEAR \$100.000 /YEAR \$10

1. DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE IN RORA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

*S310N

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 5: ACCESS RESTRICTIONS WITH RCRA CAP, MODIFIED GROUNDWATER INTERCEPTION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

FRESENT WORTH (BASED ON ANNUAL LAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST \$	ANNUAL GEN COST \$	DISCOUNT RATE	PRESENT WORTS	ANNUAL O & M COSTS:				
0 1 2 3	\$24,869,000	\$1,170,000	0.90909	\$24,869,000 \$1,063,635 \$777,689 \$706,983	ANNUAL COSTS MONITORING (\$/SAMFLING ROUND)	FIRST YEAR	AFTER FIRST YEAR	TREATHENT SYSTEM FLOW RATE @ 101 GF FIRST 5 YEARS INFLUENT PUMPING ELECTRICITY	°N - 980
556789012345678	, \$1,020,000	\$741,000 \$941,000 \$946,910 \$799,000 \$1.7,000 \$1.79,000 \$1799,000 \$1799,000 \$799,000 \$799,000 \$799,000 \$799,000	0.35049 0.31863 0.28966 6.26333 0.23939 0.21763 0.19784	\$642,712 \$587,955 \$451,012 \$410,015 \$372,741 \$338,856 \$313,409 \$280,042 \$254,585 \$231,438 \$216,401 \$436,865 \$158,865 \$158,867 \$158,874	MONITORING WELLS LABOR - MONITORING WELLS SURFACE WATER SEDIMENT LABOR - SURFACE SAMPLES AIR QUALITY MONITORING FIELD BLANKS GROUNDWATER SURFACE WATER SEDIMENT DUPLICATES GROUNDWATER	11,200 2,800 3,200	1,200 1,400 4,400 2,800 3,200	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CMENICAL USAGE FERROUS SULFATE ALFALI POLYMER FACT SYSTEM ELECTRICITY SOLIDS HAULING	327 38,745 68,880 169 18,490 2,945 38,500 8,885
18 170 221 223 224 226 227 228		\$799,000 \$799,000 \$812,910 \$799,000 \$799,000 \$799,000 \$804,910		\$143,708 \$130,644 \$120,831 \$107,769 \$98,157 \$89,232 \$81,122 \$74,293	DUPLICATES GROUNDWATER SURFACE WATER SEDIMENT SHIPPING CHARGES \$/YR		2,800 3,200 4,000 \$118,000	AIR COMPRESSOR	15,440 54,400 8,200 250,560 93,960
25 26 27 28 29 30	\$8,985,000	\$804,910 \$799,000 \$799,000 \$799,000 \$799,000 \$812,910	0.0923 0.08391 0.07628 0.06934 0.06304 0.05731	\$74,293 \$67,044 \$60,948 \$55,403 \$50,369 \$561,518	AMMUAL COSTS (SAME EVERY YEAR, \$/YR) INSPECTION SEN. MAINTEMANCE	3,600		SAMPLE SHIPPING CHARGES DPERATING COST	33,600 2,400
	M PRESENT WORTH EPLACEMENT PRESEN			\$8,292,000 \$759,000	FENCE MAINTENANCE	127,300 3,600 49,580		TREATMENT SYSTEM FLOW RATE @ 66 GPP AFTER 5 YEARS	1 -
TOTAL PR	RESENT WORTH			\$33,921,000	GROUNDWATER INTERCEPTION LEACHATE COLLECTION	2,000 1,000		ELECTRICITY	98ú
NOTES:	NO FIXATION OF	THE SLUDGE ASSI	DGE TO BE IN A RC UMED TO BE REQUIR	ED.	TOTAL ANNUAL COSTS (\$/YEAR) MONAMMUAL MAINTENANCE (\$/ACTIVITY) REFURBISH SCREENS (EVERY 10 YEARS)			PRECIPITATION SYSTEM ELECTRICITY SLUDGE HALLING SLUDGE DISPOSAL CHEMICAL USAGE FERROUS SULFATE	14,965 26,640
2.	IF INCINERATION IS REQUIRED, THE WHICH IS NOT I	OF PACT SOLIDS ADDITIONAL PR KCLUDED) IS:	S AT \$ 0.50 / LB. RESENT WORTH	\$957,000	REFURBISH SCREENS (EVERY 10 YEARS) Monitoring Wells Groundwater Interception System			FERROUS SULFATE ALKAL1 POLYMER	7,415 1,920
	THE PRESENT MOR IN A RCRA LANDF THE TOTAL PRESEN	TH OF THE PACT ILL, TO BE SUBT BY WORTH IS:	SOLIDS DISPOSAL FRACTED FROM	\$77,000	GROUNDWATER/LEACHATE COLLECTION PUMP REPLACEMENT FRENCH ORAIN (EVERY 5 YEARS) LEACHATE COLLECTION (EVERY 5 YEARS)	\$1,000 \$500		PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	38,500 1,800 3,200 9,200
					CLEAN TILE SYSTEM (EVERY 5 YEARS) LEACHATE COLLECTION SYSTEM GROUNDWATER INTERCEPTION SYSTEM	\$2,860 \$1,550	•	AIR COMPRESSOR ELECTRICITY MAINTENANCE SUPERVISION	8,200 250,560 93,960 33,600
								EAMPLE SHIPPING CHARGES OPERATING COST	2,400

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 6: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

***	DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL		ASSUMPTIONS
	DIRECT CAPITAL COSTS			: :			
1.	REMOVE CREEK AND LEACHATE SEDIMENT			, ; ;			
	EXCAVATE	4200	CY	8	33,600		
	BACKFILL EXCAVATION MATERIAL PLACEMENT	4000 4000	CY	10	40,000 20,000		CLAY BACKFILL 300 FT. MAUL, 4" LIFTS, 4 PASSES
	ESTABLISH VESETATIVE COVER SOIL Hydroseed	6B00	CY SF	0.03	34,000 1,836		I UNSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
	SUBTOTAL		:	; ; ;		\$129,000	
2.	REROUTE FINLEY CREEK AND UNNAMED DITCH			i ! !			4300 FT. REROUTED
	EXCAVATE NEW CREEK "TD RIPRAP	3255 540	CY	20 74	65,100 39,960		TILL, EXCAVATE AND HAUL (MET)
	SUBTOTAL				i !	\$105,000	
3.	ECC SITE WORK						
	REMOVE PROCESS BUILDING BUILDING REMOVAL FOUNDATION DEMOLITION DISPOSAL		CF SF CY	0.2 3.3 3.7	21,750 11,963 1,332		: ISINGLE BLDG, NO SALVAGE ICONCRETE SLÅB, REINFORCED I FOOT THICK DENOLISHED BUILDING VOLUME AND FDN. VOLUME
	REMOVE CONCRETE PAD DENOLITION DISPOSAL DENOME CONTRACTOR STUDGE (SQ 1)	30500 850	SF CY	3.7	91,500 3,145		DEMOLISH CONCRETE PAD ASSUME 0.75 FEET THICK
	REMOVE CONTAMINATED SLUDGE/SOIL TESTING PRIOR TO EXCAVATION EXCAVATE TRUCK LINGRS HAUL OFFSITE DISPOSAL @ RCRA FACILITY	730 730	LS CY EA CY	14000 3.4 200 43 80	14,000 6,205 7,400 31,390 58,400		BACKHOE EXCAY, & DOUBLED FOR H&S 225 MI HAUL, 730 CY
	REMOVE EXTRACTED CONTAMINATED GROUNDWA: HAUL OFFSITE TREATMENT & RCRA FACILITY	9000	GAL GAL	0.24 0.24	2,160 2,160		\$450/TRUCK, \$3.25/MILE, 225 MILES TO FACILITY TRUCK HANDLING AND TREATHENT
	SUBTOTAL			! !		\$251,000	
4.	HONITORING PROGRAM						
	MONITORING WELLS 11 - UPPER GLACIAL TILL 13 - MID-DEPTH 2 - DEEP SAND AND GRAVEL	320 490 350		60 60 75	19,200 29,400 26,250		SHALLOW - HOLLOW STEM AUGER DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
	PIEZOMETERS 2 - UPPER GLACIAL TILL 2 - NID-DEPTH	40	LF LF	60 04	2,400 4,200		SHALLOW - HOLLOW STEM AUGER
	SUBTOTAL				·	\$81,000	
5.	RCRA CAP CONSTRUCTION						
	PRELIMIMARY GRADING FILL - BICAVATE & HAUL FILL - BACKFILL DRAINAGE LAYER	213100 213100		6 3	1,27 8 ,600 639,300		USE ONSITE SOIL (COMMON EARTH)
	EXCAVATÉ & MAUL Backfill	113000	CY .	B 3	904,000 339,000		
	CLÁY LAYER EICAVATE & HAUL BACKFILL GEOTEXTILE	247000 247000 740000	EY CY	3	2,470,000 741,000 1,110,000		2 FT. THICK, COMPACTED 2 LAYERS DF POLYPROPYLEME

AFPENDIX TABLE A-17 PAGE 2

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE &: ACCESS RESTRICTIONS WITH RCKA CAP, GROUNDMATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	: :QUANTITY ::=======	:UNIT:	UNIT PRICE	TOTAL	COST	ASSUMPTIONS
DIRECT CAPITAL COSTS						
SYNTEHTIC HEMBRANE	370000	SY	1.8	666,000		30 MIL. PVC USE ONSITE SOIL (COMMON EARTH)
SAND LAYER EXCAVATE & HAUL BACKFILL	185000 185000	CY		1,480,000 555,000		TOSE DWOLLE SULE (COMMON ENVIA)
ESTABLISH VEGETATIVE COVER Soil Hydroseed	124000 3329000	CY	0.03	620,000 99,870		UNSITE TILL, EXCAVATE, HAUL, BACFFILL HYDRAULIC SPREADER
SUBTOTAL			****	,	\$10,903,000	
5. GROUNDWATER ISOLATION AND COLLECTION						TO ISOLATE LANDFILL FROM GROUNDWATER
EXTRACTION WELLS Install Wells EJECTORS	3930	LF EA	60 500			NELL EJECTOR SYSTEM 8 IN DIAMETER, AIR ROTARY DRILLED
HEADER PIPE PUMPS COMMECTIONS VALVES COLLECTION PIPE	3800 2 328	: LF : EA : EA : EA	3000 45 300	15,200 6,000 14,760 98,400		4 IN DIAMETER, METAL (ROUGH ESTIMATE ON COST) (HETAL ELBONS, 4 PER MELL (HETAL BALL VALVES, 4 PER MELL (HETAL, 4 IN DIAMETER
TRENCH FOR PIPE FRENCH DRAINS SHORING AND BRACING DEWATERING	139100	EA :	5 2 605	278,200 3,630		A FT DEEP, 3 FT MIDE HOUDD SHEETING, WALES, BRACES SUMP PUMPS
EXCAVATE TRENCH LINE TRENCH	20600	: :	4	82,400		
IMPERVIOUS MEMBRANE PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL RACKFILL SUMP/PIMP STATION MANHOLES		SF LF	0.2 0.17 6 15 4500 1902			HETAL, 8° DIA. 16 GAGE GRAVEL FILL, COMPACTED FFIBERGEASS SUMP. INCLUDES PUMP(SIMPLEX) AND CONTROLS. PRECAST CONC., 4° 10, 25° DEEP
SUBTOTAL					\$1,199,000	
7. LEACHATE COLLECTION SYSTEM						
EXCAVATE TRENCH LINE TRENCH	2540	: :	8	•		4' DEEP, \$ DOUBLED FOR H & S
PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BACKFILL SUMP/PUMP STATION MANHOLES		LF	0.17 6 15 4500 650	34,320 362,250		HETAL, 8" DIA., 16 SAGE IN TRENCH & UP SLOPE IFIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS IPRECAST CONC., 4' ID, 6' DEEP
SUBTOTAL					\$435,000	
8. GROUNDWATER COLLECTION - ECC						
FRENCH DRAINS SOIL BORING PRIOR TO EXCAVATION SHORING AND BRACING DEMATERING EXCAVATE TRENCH PERVIOUS GEOTEXTILE PERFORATED PIPE GRAVEL BACKFILL COLLECTOR & RISER PIPE CONNECTIONS MET WELL SUMP PUMP	92000 13600 205200 4700 13600 1000 18	EA CY SF LF CY	36000 2 440 4 0.17 4 15 4 39 2300 2100	36,000 184,000 1,760 54,400 34,884 18,800 204,000 4,000 702 2,300 2,106		46 BORINGS ON SO FT CENTERS TRENCH - 17' DEEP, 4' MIDE, 5400' LONG (TOTAL), WOOD SH. SUMP PUMPS METAL, 4° DIA. GRAVEL BACKFILL, COMPACTED METAL, 4° DIA. (TOTAL 0) PRECAST CONC., MANHOLE, 6' ID, 16' DEEP
SUBTOTAL	•				\$507,000	

APPENDIX TABLE A-17

157 OIMER COMPATIBILITY CONTINUES CLEAR				•				
SCIDLE CONTINUES 12 12 12 12 12 12 12 1		; •					яЭН10	17.
11 COM11NEE NITE 12 12 12 12 12 12 12 1		452,205,000					CONSTRUCTION TOTAL	
COMPANDED CONSTRUCTION CARBIDISTS COMPANDED FIRE			000129212				BID CONTINCENCIES (12 %)	
STREET S		i					CONTINEENCIES	.11
STORMER STOR		000,127,21\$					CONSTRUCTION SUBTOTAL	
10 10 10 10 10 10 10 10		000'811\$					JAT018U2	
CENEURE CHAPTER COLUMN	1 SIGN EVERY 150 FT. ALONG FENCE	;	7*049					
DIRECT CAPITEL COSTS 1 1 1 1 1 1 1 1 1	P. CHUIN FINK NITH BARBED WIRE				: ¥3 [£ :	3 6200	EVIE Lencine	
DIRECT CRAITE COSTS 12 20,000 100,000		•					ACCESS RESTRICTIONS	.01
STEELERS 400 12 300 100		\$2,025,000					TH1018U2	
DIRECT CAPITION STORMEN 100 LET 101 OC 100 OCO		<u> </u>			. AS	120		
100 10 10 10 10 10 10 1	SO EL MIDE BA SOO EL FOME	<u> </u>			: :		VCCE22 BOVD	
			009	9	: 37:	100	3919	
STIE BREE STEEL	3 FT DEEP X 4 FT MIDE, 100 FT TRENCH						3112 DRAIMAGE	
STIE MARK STIE			2,200	1	AS	00/9	9010089	
INTERINE INTERINE	i ·		008,8	•	, AJ	3200	SITE PREPARATION	
DESCRIPTION DESCRIPTION SUMMITTY WHITE FILE TOTAL COST ASSUMPTIONS								
DESCRIPTION DESCRIPTION			000'11 3	000'11	: 57:	1 :	INSTRUMENTATION AND CONTROLS	
9. GROUNDWATER/LEGARATE TREATHERT 9. GROUNDWATER/LEGARATE TREATHERT 1. S. 700, 100, 100, 100, 100, 100, 100, 100,		<u> </u>	16,000	000,41	57			
DESCRIPTION GUANTITY WHIT FRICE 101AL COST ASSUMPTIONS	AVERAGE PRICE OF TWO SYSTEMS		92,000	95,000	51		GRANULAR NEDIA FILTER	
DESCRIPTION GUANTITY WHIT FRICE 101AL COST ASSUMPTIONS			000'Z	200	YAG	,		
OFFICE CAPTER TREATHEN	1) TO CE 45	<u> </u>	000,02	000,02	57: 51:		FILTER PRESS	
DIRECT CAPITAL COSTS DIRECT CAPITAL CA	WODET 25-A		715,000	000,217	51	1 ;	PACT SYSTEM PACT PACKAGE	
DESCRIPTION SYSTEM GUANTITY : UNIT: FRICE 101AL COST ASSUMPTIONS			005*2	200	YAG	s	9019A12	
DESCRIPTION SYSTEM GUANTITY : UNIT: FRICE 101AL COST ASSUMPTIONS	STEEL TANK		2,000 4,300	2,000	57 51		NEUTRALIZATION TANK	
DESCRIPTION DIRECT CAPITAL COSTS 9. GROUNDWATER/LEACHATE TREATHENT PURCUENT PUMPING THE LUENT PUMPING THE LUENT PUMPING PUMPS 2. EA. 6,600 10,000 10,	FRP TANK	!	000 Z	000'Z	51 51		SOFIDS SLOWVEE LYNK	
DESCRIPTION STORM GUANTITY : UNIT: PRICE TOTAL COST ASSUMERSIBLE PUMP 1. 660UNDWATER/LEACHATE TREATMENT 2. 660UNDWATER/LEACHATE TREATMENT 3. 100,000 100,000 SALLON EQUALIZATION/STORAGE TANK 4. 660UNDWATER/LEACHATE TREATMENT 5. 100,000 100,000 SALLON EQUALIZATION/STORAGE TANK 6. 600 13,200 100,000 SALLON EQUALIZATION/STORAGE TANK 7. 1 12 100,000 SALLON EQUALIZATION/STORAGE TANK 8. 6,600 13,200 100,000 SALLON EQUALIZATION/STORAGE TANK 9. 660UNDWATER/LEACHATE TREATMENT 1. 12 100,000 100,000 SALLON EQUALIZATION/STORAGE TANK 1. 12 100,000 100,000 SALLON EQUALIZATION/STORAGE TANK 1. 12 100,000	PAREKAGE PRICE OF TWO SYSTEMS	:	134,000	124,000	: 57:	1 ;	PRECIPITATION SYSTEM PACKAGE	
DESCRIPTION GUANTITY (UNIT) FRICE TOTAL COST ASSUMPTIONS 9. GROUNDWATER/LEACHATE TREATHENT 1016-ECT CAPITAL COSTS	CONTRACTOR OF THE PRINCES	1 1 1	V33 1	055 1	, V3			
DESCRIPTION GUANTITY (UNIT) FRICE TOTAL COST ASSUMPTIONS 9. GROUNDWATER/LEACHATE TREATHENT 1016-ECT CAPITAL COSTS	208/E8219FE bruk 2007/000 PREFIDE ERONETTRILLON/SIDWHPE INN	·	12,200	00919	¥3	Z .	DAMBS Ennyettestam/Slawere	
DESCRIBED CORRES OF TOOL OF TO	4441 3344012\MUITATI JAHO 401 143 400 001		000 001	000 901	31	,		
SEGRITAMUSSA : ISO3 19101; FRICE : 15104 COST	DESIEN BULE OF 341 GPM						GROUNDMATER/LEACHATE TREATMENT	-6
SEGRITAMUSSA : ISO3 19101; FRICE : 15104 COST		! † !					תועברו דאנוואר רחשום	
DESCRIPTION GUARNITY UNIT: PRICE: TOTAL COST: ASSUMPTIONS		1 } ! !						
			JATOT	33184	LINN			

APPENDIX TABLE A-17

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE A: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

PAGE 4

DESCRIPTION	QUANTITY		TOTAL COST	ASSUMPT!GNS
DIRECT CAFITAL COSTS				
PERMITTING (5 %) SERVICES DURING CONSTRUCTION			1,260,009 500,000	
TOTAL IMPLEMENTATION COST			\$26,963,000	
13. ENGINEERING				
ENGINEERING DESIGN COST		 	600,000	! !
TOTAL CAPITAL COST		 	\$27,563,000	;

AFPENDIX TABLE A-18 FAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 6: ACCESS RESTRICTIONS WITH RORA CAP, GROUNDWATER ISOLATION AND LEACHATE COLLECTION AND TREATMENT

DESCRIPTION	EUANTITY	UNIT	UNIT PRICE	IOTAL C	051	ASSUMPTIONS
REFLACEMENT COSTS						
1. TREATMENT PLANT						REPLACEMENT AT YEAR 15, FLOWRATE OF 5 GPM
INFLUENT PUMPING EQUALIZATIOM/STORAGE FUMPS	1 2	LS EA	100,000	100,000 13,200		100.000 GALLON EQUALIZATION/STORAGE TANK SUBMERSIBLE PUMP
FRECIPITATION SYSTEM IN-LINE MIJER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALIZATION TANK STARTUP	1 1 1	EA LS LS LS LS	850 18,000 47,000 1,200 1,800 500	850 18,000 47,000 1,200 1,800 2,000		2 IN. IN-LINE MIXER :AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 CU FT :FRP TANK :STEEL TANK
PACT SYSTEM PACT PACKAGE STARTUP	1	LS Day	124,000 500	124,000 2,000		MODEL SS-A
GRANULAR MEDIA FILTER	1	LS	23,000	23,000		AVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS	1	LS LS	5,000 41,000	5,000 41,000		
RETROFIT EXPENSES	1	LS	20,000	20,000		
SUBTOTAL (TO NEAREST \$1000)					\$399,000	
2. RCRA CAP REPLACEMENT						REPLACEMENT AT 30 YEARS
DRAINAGE LAYER EXCAVATE & HAUL BACKFILL	113000 113000	CY	a 3	904,000 339,000		1.5 FT. THICK SAND AND GRAVEL, COMPACTED
CLAY LAYER Excavate & Haul Backfill Geotextile	247000 247000 74000	CY CY SY	10 3 1.5	2,470,000 741,000 1,110,000		2 FT. THICK, COMPACTED 2 LAYERS OF POLYPROPYLENE
SYNTEHTIC MEMBRANE SAND LAYER EXCAVATE & HAUL BACKFILL ESTARLISH VEGETATIVE COVER	370000 185000 185000	CY	1.8 1.8	466,000 1.480,000 555,000		30 MIL, PVE USE ONSITE SOIL (COMMON EARTH)
SOIL HYDROSEED	124000 3329000		0.03	620,000 99,876		DMSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
SUBTOTAL (TO MEAREST \$1000)		; ; ;	========		\$8,985,000	

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 6: ACCESS RESTRICTIONS WITH RORA CAP, GROUNDWATER ISOLATION COLLECTION, LEACHATE COLLECTION AND TREATMENT

DESCRIFTION	QUANTITY			TOTAL		ASSUMPTIONS
GIRECT OPERATION AND MAINTENANCE COSTS] 		
1. MONITORING (\$/SAMPLING ROUND)		!		FIRST YEAR	AFTER FIRST YEAR	DINACTEDLY FOR ICT VC SCHI-ANNHALLY THEREACTED
MONITORING WELLS LABOR FOR MONITORING WELLS SURFACE WATER SEDIMENT LABOR FOR SURFACE SAMPLES AIR QUALITY MONITORING	8 8 1	EA DAY EA EA DAY	1400 1000 1400 1600 600 700	229,600 24,000 22,400 25,600 1,200 1,400	12,000 22,400 25,600 1,200	DUARTERLY FOR IST YR., SEMI-ANNUALLY THEREAFTER FOR GROUNDWATER, OTHERS SEMI-ANNUALLY 14 WELLS AFTER FIRST YEAR, \$1100/WELL 11 E1, 2 TECH'S 6 DAYS 11 E1, 1 TECH, 1 DAY , SEMI-ANNUALLY 1Hou, OVA - 1 E3, 1 TECH, 1 DAY , SEMI-ANNUALLY
FIELD BLANKS GROUNDWATER SURFACE WATER SEDIMENT OUPLICATES	2	EA EA EA	1400 1400	11,200 2,800 3,200	•	\$1100/MELL AFTER I YEAR
GROUNDMATER SURFACE MATER SEDIMENT SHIPPIMG CHARGES		EA EA EA LS	1400	11,200 2,800 3,200 8,000	4,400 2,800 3,200 4,000	\$1100/MELL AFTER 1 YEAR 3 SAMPLES/CODLER - \$100/CODLER
2. TREATMENT PLANT OPERATION (\$/YEAR)						
TREATMENT SYSTEM FLOW RATE 0 341 SPM - - FIRST 5 YEARS						
INFLUENT PUMPING ELECTRICITY	19600	ku-h	0.05	980		·
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAWLING SLUDGE DISPOSAL CHEMICAL BEAGE	1770	ku-h TON TON		327 79,650 141,600		
CHENICAL USAGE FERROUS SULFATE ALKAL I LIME I POLYMER USAGE ACID USAGE	281 778500 2980 -Minimal-	:LB :	2.11 0.05 3.35	593 38,925 9,983		AS FERROUS SULFATE HEPTAHYDRIDE & 2 PPM PERCOL 776
PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE		TON:		38,500 11,385 20,240 61,320		0.5 lb PAC/lb COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	164000	kw-h	0.05	8,200		
MAINTEMANCE SUPERVISION MONITORING SAMFLE SHIPPING CHARGES	8352 2088 24 24	:HR :	30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
TREATHENT SYSTEM FLOW RATE @ 211 GPM - - YEARS 5 THROUGH 15						
INFLUENT PUMPING ELECTRICITY	19600	kw-h	0.05	98 0		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAWLING SLUDGE DISPOSAL		kw-h TON TON		327 36,675 65,200		
CHEMICAL USAGE FERROUS SULFATE ALKALI (LIME) POLYMER USAGE	193 372800 1840	LB :	2.11 0.05 3.35			AS FERROUS SULFATE HEPTAHYDRIDE 2 PFM PERCCL 776

APPENDIX TARLE 6-19

	CLEAN EVERY 10 YRS, - 4 MPS, LABOR, 2 PEOPLE	; ; ;	090°2 000°9	: 9002 9039	: 57 : 57		CVE KEPATKS COLLECTION SYSTEM WELLS KONTORING WELLS :
	REPLACE EVERY 5 YEARS	;	061.5	9012	51	!	GROUNDWATER COLLECTION-ECC FUMP REFLACE: REFURBISH WELL SCREEKS
	REPLACE EVERY 5 YEARS REPLACE EVERY 5 YEARS SELECE ALL PUMPS EVERY 3 YEARS	:	00\$ 000*1 002*9	705 1 0001 1 0012	51 51 8	; 1	GROUMOWATER/LEACHATE COLLECTION EXTRACTION WELLS - EJECTOR REFLACEMENT FRENCH RAIN FUMP EVACEMENT LEACHATE COLLECTION FUMP FEPLACEMENT
1		1				; ; ;	S, DTHER MAINTENANCE (\$/YEAR)
	1 E1, 1 TECH, 3 DAYS, TWICE PER YEAR	: ! !	2*900	1800	S٦	1	MOITO392N1 3112
							4. INSPECTION (\$/YEAR)
			929 9*000 1*000	629 6009 6001	51 51 51	1	LEACHATE COLLECTION SYSTEM BROUNDWATER LSOLATION SYSTEM - ECC
							2" DOWN ELECTRICITY (\$/YEAR)
	4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH	! ! !	5*400 22*900 42'490 520*280	100 1400 42 42 20	HR :	54 54 5088 8225	MDINTEMANCE SUPERVISION HONITORING SANFLE SHIPPING CHARGES
			1.650	20.0	ц-ма	22000	OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY
7	803 ATV116 CO8		1,300 1,760 1,300	50.0 50.0 50.0	HOT :	19400 25 27 27 29000	CWWRON NZWEE 201102 DIZHOZH 201102 HANT IME ETECLHICI IA 54CI ZAZIEM
	AS FERROUS SULFATE HEPTAHYDRIDE 2 PPM PERCOL 776		21 092,1 72!	2°22 0°02 5°11	81	7 47 51800 71800	CHEMICAL USAGE FEMBORS SULFAIE FEMBORS SULFAIE CHEMICAL USAGE
			2,575 5,575 5,575 5,000	08 50:0	H-H3 100 100	S1 S1 0159	PRECIPITAN SYSTEM SLUDGE HAULING SLUDGE DISPOSAL SLUDGE DISPOSAL
			1 91	20.0	4-# 3	2530	INFLUENT PLANTING ELECTRICITY
							TREATHENT SYSTEM FLOW RATE & 6 GPM - - AFTER 15 YEARS
	4 FULL TIME OPERATORS FULL TIME SUPERYISON THELUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIFMENTS PER MONTH		5,400 22,600 93,960 250,560	100 1400 42 20	. A3	24 24 2088 8222	MAINTEMANCE SUPERVISION HONITORING SAMPLE SHIPPING CHARGES T
			002.B	S0.0	4- 87	000#91	DTHER EQUIPMENT - ELECTRICITY AIR COMPRESSOR - ELECTRICITY
	0.5 at \240.2 dt \2.0,		28,546 5,746 5,246 12,120 12,120	50.0 08 24 20.0	: NOT	770000 72 72 50300	FACT SYSTEM SOLIDS DISPOSAL SOLIDS DISPOSAL CARBON USABE
				:	87	-HINING-	ACID USAGE
		1 1 1 1					21203 33MANJIWIAM OND WOITARARICE COSTS
=======	ZNOI 1 4MUZZÁ		JAT01 		:TIME	YTTTNAU9	DESCRIBITION

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 6: ACCESS RESTRICTIONS MITH RCRA CAP, EROUNDMATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATHENT

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OCHBINED ALTERNATIVE ANALYSIS - ALTERNATIVE & ACCESS RESTRICTIONS WITH RORA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHAIE COLLECTION AND TREATMENT

==	FILL 2" SETTLEMENT OVER SOZ OF LANDFILL YEARLY		5,750 2,850 2,600 2,600 94,000	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	37 31 31 32 37	0096 97	DIRECT DEFRATION RND MAINTEMANCE COSTS EROSION CONTROL FREEZE/THAN REPAIRS FRUE NAIMERANCE MONING CLEM TILE SYSTEM LEACHATE COLLECTION SYSTEM - NSL EROUNDWATER ISOLATION SYSTEM - ECC
;==	ENGIT MUZZA	1503	JATÜT	TINU PRICE	::=== :[ΝΛ	YTTINAUG	DESCRIPTION

NOTES:

- 1. DISFGSAL OF PRECIPITATION SLUDGE ASSUMED TO BE TH RCRA LANDFILL.
 NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.
- 2. PRCT CARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RORA LANDFILL. IF REGULATIONS REQUIRE INCINERATION COST (YEARS 5 TO 15): \$253,000 /YEAR \$10.051: \$10.051: \$253,000 /YEAR \$250:051 (YEARS 5 TO 15): \$250,000 /YEAR \$250:051 (YEARS 5 TO 15): \$250,000 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$250:051 (YEARS 15 TO 20): \$250:050 /YEAR \$

COMBINED ALTERMATIVE ANALYSIS - ALTERNATIVE 6: ACCESS RESTRICTIONS WITH ROKA CAF, GROUNCMATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT

FRESENT NORTH (SASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST \$	EGST \$	102	WORTH	ANNUAL O & M COSTS:						
0 -	\$27,567,600	\$1,331,000 \$1,102,000 \$1,108,300	0.90909 0.82645 0.75131 0.68301	\$27,567,000 \$1,209,999 \$910,748 \$832,677 \$752,677	ANNUAL COSTS HONITORING (#/SAMPLING ROUND)	FIRST YEAR	AFTER FIRST YEAR	TREATMENT SYSTEM FLOW RATE & FIRST 5 YEARS INFLUENT PUMPING ELECTRICITY	741 GPM -	TREATMENT SYSTEM FLOW RATE & AFTER 15 YEARS INFLUENT PUMPING ELECTRICITY	6 GFM -
5 5 10 11 12 13		\$1,102,000 \$1,113,910 \$972,300 \$887,000 \$887,000 \$893,300 \$704,910 \$887,000 \$887,000	0.62092 0.56447 0.51316 0.46451 0.4241 0.38554 0.35049 0.31863 0.28966	8691,649 \$504,241 \$455,173 \$413,794 \$378,849 \$349,650 \$310,885 \$284,632	MONITORING WELLS LABOR - MONITORING WELLS SURFACE WATER SEDIMENT LABOR - SURFACE SAMPLES AIR DUALITY MONITORING FIELD BLANKS GROUNDWATER	1,200 1,400	39,800 12,600 22,400 25,600 1,209 1,400	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHENICAL USAGE FERROUS SULFATE ALKALI	327 79,550 141,600 593 38 225	FRECIPITATION SYSTEM ELECTRICITY SLUBGE HAULING SLUBGE DISPOSAL CHEMICAL USAGE FERROUS SULFATE ALKALI	327 3,375 6,000 15 1,590
14 15 16 17 19	\$399 ,000	\$887,000 \$905,210 \$714,000 \$714,000 \$720,300 \$714,000 \$733,910	0.26333 0.23939 0.21763 0.19784 0.17986 0.16351 0.14864	\$256,928 \$233,574 \$312,215 \$155,388 \$141,258 \$129,553 \$116,746 \$109,088	: DOPTITATES	11,200 2,800 3,200 11,200 2,800 3,200 8,000		PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	38,500 11,385 20,240 61,320	PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARSON USACE	1,300 990 1,766 5,560
19 20 21 223 24 226 227 28		\$720,300 \$714,000 \$714,000 \$720,300 \$725,910 \$714,000 \$720,300 \$714,000	0.13513 0.12285 0.11168 0.10153 0.0923 0.08391 0.07628 0.06934	\$97,334 \$87,715 \$79,740 \$73,132 \$67,001 \$59,912 \$54,944 \$49,509	\$/YR ANNUAL COSTS (SAME EVERY YEAR, \$/YR)	·	\$118,000	AIR COMPRESSOR ELECTRICITY HAINTENANCE SUPERVISION HONITORING SAMPLE SHIPPING CHARGES	8,200 250,560 93,960 33,600 2,400	: MAINTENANCE : SUPERVISION : MONITORING	1,650 250,560 93,960 33,600 2,400
29 30	\$8,985,000	\$714,000 \$740,210	0.06304 0.05731	\$45,011 \$557,352	INSPECTION	3,600		OPERATING COST	\$792,000 £	OPERATING COST	\$404,000
	M PRESENT WORTH			\$9,111,000	CAP REPAIRS FENCE MAINTENANCE	127,300 3,600 49,580		TREATMENT SYSTEM FLOW RATE & YEARS 5 TO 15	211 GPM -	1 1 1	
TOTAL PR	FLACEMENT PRESENT	F WORTH		\$610,000 \$37,284,000	: PUMP ELECTRICITY	1,000 6,000 650		INFLUENT PUMPING ELECTRICITY PRECIPITATION SYSTEM	980		
NOTES:	NO FIXATION OF 1	THE SLUDGE ASSI	GE TO BE IN A RC MED TO BE REQUIR	RA LANDFILL. ED.	TOTAL ANNUAL COSTS (\$/YEAR) NOMANNUAL MAINTENANCE (\$/ACTIVITY)	\$192,000		: ELECTRICITY : SLUDGE HAWLING : SLUDGE DISPOSAL : CHEMICAL USAGE : FERROUS SULFATE	327 36,675 65,200 407		
2.	IF INCINERATION IS REQUIRED, THE (WHICH IS NOT IN	OF PACT SOLIDS E ADDITIONAL PE (CLUDED) IS:	AT \$ 0.50 / LB. ESENT WORTH	\$1,201,000	REFURBISH SCREENS (EVERY 10 YEARS) MONITORING WELLS COLLECTION SYSTEM WELLS	\$6,000 \$2,000		ALKALI POLYMER	18.690 6,164		
	THE FRESENT MORI IN A RERA LANDFI THE TOTAL PRESEN	TH OF THE PACT LL, TO BE SUBT IT WORTH IS:	SOLIDS DISPOSAL RACTED FROM	\$76, 000	TOTAL ANNUAL COSTS (\$/YEAR) NOMANHUAL MAINTENANCE (\$/ACTIVITY) REFURBISH SCREENS (EVERY 10 YEARS) MONITORING MELLS COLLECTION SYSTEM WELLS BROUNDWATER/LEACHATE COLLECTION PUMP REPLACEMENT EJECTOR REPLACEMENT (EVERY 7 YEARS) FRENCH DRAIN (EVERY 5 YEARS) LEACHATE COLLECTION (EVERY 5 YEARS) GROUNDWATER (COLLECTION TO SYSTEM GROUNDWATER (COLLECTION SYSTEM GROUNDWATER FOLLECTION SYSTEM GROUNDWATER COLLECTION SYSTEM GROUNDWATER COLLECTION SYSTEM	\$6,300 \$1,000 \$500 \$2,100 \$2,750 \$2,750		FALL STSTEM ELECTRICITY SOLIDS HAWLING SOLIDS DISFOSAL CARBON USAGE AIR COMPRESSOR ELECTRICITY MAINTENANCE SUPERVISION MONITORING	38,500 3,240 5,760 12,120 8,200 250,560 97,960 33,600		
					•			SAMPLE SHIPPING CHARGES OPERATING COST	2,400 4577,000	! !	

APPENDIX TABLE A:21 FAGE 1

COMBINED ALTERNATIVE AMALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/CGLLECTION, LEACHATE COLLECTION AND TREATMENT SOLL VAPOR EXTRACTION AT ECC

**=		: : BUANTITY : =======			TOTAL		ASSUMFTIONS
	DIRECT CAPITAL COSTS	: :		! !	! !		
1.	REMOVE CREEK AND LEACHATE SEDIMENT						
	EXCAVATE Backfill excavation	4200	CY	8	33,600		
	MATERIAL Placement	4000 4000	CY	10 5	40,000 20,000		CLAY BACKFILL 300 FT. HAUL, 4" LIFTS, 4 PASSES
	ESTABLISH VEGETATIVE COVER SOIL HYDROSEED	6800 61200	CY SF	0.03	34,000 1,836		ONSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
	SUBTOTAL				: !	\$129,000	
2.	REROUTE FINLEY CREEK AND UNNAMED DITCH				:		4300 FT. REROUTED
	EXCAVATE NEW CREEK BED RIPRAP		CY	20 74	65,100 39,960		TILL, EXCAVATE AND HAUL (MET)
	SUBTOTAL)))	\$105,000	
3.	ECC SITE WORK						
	REMOVE PROCESS BUILDING BUILDING REMOVAL FOUNDATION DEMOLITION DISPOSAL	108750 3625 360		0.2 3.3 3.7	21.750 11.963 1,332		SINGLE BLDG, NO SALVAGE CONCRETE SLÅB, REINFORCED I FOOT THICK DEMOLISHED BUILDING VOLUME AND FDM. VOLUME
	REMOVE CONCRETE PAD Demolition Disposal	30500 850	SF CY	3.7	91,500 3,145		: IDEMOLISH CONCRETE PAD FASSUME 0.75 FEET THICK
	REMOVE CONTAMINATED SLUDGE/SOIL TESTING PRIOR TO EXCAVATION	: 1	LS	! : 14000	14,000		
	EXCAVATE TRUCK LINERS HAUL OFFSITE	730	EA CY	200 43	6,205 7,400 31,390		BACKHOE EXCAV, & DOUBLED FOR H&S 225 MI HAUL, 730 CY
	DISPOSAL € RCRA FACILITY REMOVE EXTRACTED CONTAMINATED GROUNDWAT HAUL OFFSITE		CY.	0.24	58,400 2,160		\$450/TRUCK, \$3.25/MILE, 225 MILES TO FACILITY
	TREATMENT & RCRA FACILITY	9000		0.24	2,160		TRUCK HANDLING AND TREATHENT
	SUBTOTAL					\$251,000	·
4.	MONITORING PROGRAM					;	
	MONITORING WELLS 11 - UPPER GLACIAL TILL	320		60	19,200 29,400	;	SHALLOW - HOLLOW STEM AUGER
	13 - MID-DEPTH 2 - DEEP SAND AND GRAVEL	490 350		60 75	26,250		DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
	PIEZOMETERS 2 - UPPER BLACIAL TILL 2 - HID-DEPTH		LF LF	50 60	2,400 4,260		SHALLOW - HOLLOW STEM AUGER
	SUBTOTAL	<u> </u>				\$81,000	
5.	RCRA CAF CONSTRUCTION						
	PRELIMINARY GRADING FILL - EXCAVATE & HAUL	213100			1,278,600		USE DWSITE SOIL (COMMON EARTH)
	FILL - BACKFILL DRAINAGE LAYER	213100			639,369	:	1.5 FT. THICK SAND AND GRAVEL, COMPACTED
	EXCAVATE & HAUL BACKFILL	113000 113000	CY CY	B 3	904,000 339,000		
	CLAY LAYER EXCAVATE & HAUL BACKFILL	247000 247000	CY		2,470,000 741,000		2 FT. THICK, COMPACTED

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHAITE COLLECTION AND TREATMENT
, SOIL VAPOR EXTRACTION AT ECC.

46 BORINGS ON SO FT CENTERS SUMP PUMPS HETAL, 4" DIA. BRAVEL BACKFILL, COMPACTED METAL, 4" DIA. PRECAST CONC., MANHOLE, 6' ID, 16' DEEP PRECAST CONC., MANHOLE, 6' ID, 16' DEEP		5*200 5*200 504*000 24*800 24*400 1*200 1*200	51 51 61'0 71'0	. 43 35 35 40 43	18 1000 12000 12000 502500 12000 4	FRENCH DRAINS SOLL BORING PRIOR TO EXCAVATION SOUL BORING BRACING DELATERING PERVIOUS EGOESTILE GRAVEL BRCKFILLE GRAVEL BRCKFILLE GRAVEL BRCKFILLE 1919 PINE WET WELL 1919 PINE
	! ! !		:			B. GROUNDWATER COLLECTION - ECC
	\$422,000					JATOTBU2
4. DEEP, \$ DOUBLED FOR H & S METAL, B" DIA., 16 GAGE IN TREMCH & UP SLOPE FIBERACAS CUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS PRECAST CONC., 4 10, 6 DEEP		4,500 362,250 34,320	1 9	: 31 :	7 2420 2450 75400	COMMITTEE FEWLOWS SEDIES THE PEWLOWS SEDIES THE PEWLOWS SEDIES THE THE TRENCH
V. DEED & DUIDIED ED EN F C		057 05	. 8	AJ	0425	EXCANATE TREMCH
	000'661'1\$		i !			SUBTOTAL 7. LEACHATE COLLECTION SYSTEM
3778 C7 ¹ 81 & ¹ *2982 (CP473)		12,514	70/1		,	S3JOHNAN
METAL, 8° DIA., 16 GAGE FIDERELASS SUMP. INCLUDES PUMP(SIMPLEX) AND CONTROLS PRECNST COMC., 4° 10, 25° DEEP PRECNST COMC., 4° 10, 25° DEEP		4,500 209,000 23,000 41,888	21 9 21 9	: 11 :	T 20000 2200 24000	CAMPÉRAM PERFORATED PIPE PERFORATED PIPE PERFORATED PIPE PERFORATED PIPE
F 440 1 4400				Ϋ́		EXCANATE TRENCH
NOOD SHEETING, WALES, BRACES		278,200		43 45	124100	
MELL EJECTOR SYSTEM B IN DIANETER, AIR ROTARY DRILLED 4 IN DIANETER, METAL (Rough estimate on Cost) (Rough estimate on Cost) Metal ball välves, 4 per mell Metal dall välves, 4 per mell 4 ft deep, 3 ft mide		8,000 14,760 14,760 15,200 15,200	200 1 200 1 2000 1 2000 1	EV ::	2000 228 228 280 2800	ETITON WELLS TRENCH FOR PIPE CONNECTION PIPE CONCESTION PIPE TOTON CONCESTIO
TO ISOLATE LANDFILL FROM GROUNDWATER						6. ERGUMDNATER ISOLATION AND COLLECTION
	\$10,903,000					TW10180S
HADBUANT IC STREADER		078,99	0.02	JS.	2254000	######################################
ONSITE TILL, EXCAVATE, HAUL, BACKFILL		000,024		ĹĴ	1	ESTABLISH VEGETATIVE COVER
		1,480,000	2	13 13	182000 182000	EXCAVATE & HAUL BACKFILE
2 LAYERS OF POLYPROPYLENE 30 MIL, PVC USE DWSITE SOIL (COMMON EARTH)	ľ	000 '999	8.1	AS :		GEOTEXTILE Syntehiic Mendrane Sand Layer
J I AVEDE OF DRI VDDOOVI ENE		500 VII 1	, ,		44441	7 11771777
						018ECT CAPITAL COSTS
SNOTT-HULSA		JATOT	,	:IINN:	YTITHAUD:	

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL VAFOR EXTRACTION AT ECC

DESCRIPTION	: :QUANTITY :======			TOTAL		ASSUMPTIONS
DIRECT CAPITAL COSTS	1					
SUBTOTAL	i !	! ! !			\$507,000	
9. GROUNDWATER/LEACHATE TREATMENT						DESIGN RATE OF 341 GPM
INFLUENT PUMPING EDUALIZATION/STOKAGE PUMPS			100,000 6,600	100,000 13,200		100,000 GALLON EQUALIZATION/STORAGE TANK SUBMERSIBLE PUMP
PRECIPITATION SYSTEM IN-LINE MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALIZATION TANK PILOT TESTING STARTUP			1,550 134,000 47,000 2,000 4,300 5,000 500	1,550 134,000 47,000 2,000 4,300 5,000 2,500		4 IN. IN-LIME MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 cu ft FRP TAMK STEEL TANK
PACT SYSTEM PACT PACKAGE FILTER PRESS PILOT TESTING STARTUP	1 1	LS	715,000 47,000 20,000 500	715,000 47,000 20,000 2,000		MODEL 55-A J-PRESS, 15 cu ft
GRANULAR MEDIA FILTER	1	LS	95,000	95,000		AVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING		LS LS SF	16,000 41,000 25	16,000 41,000 750,000		
SITE MORK SITE PREPARATION CLEARING GRADING LEVELING SITE DRAINAGE EXCAVATION PIPE	2200 6700 1100 50	SY CY CY	4 1 3 4 6	8,800 6,700 3,300 200 600		SITE AREA: 300 FT x 200 FT, 1 FT DEPTH, 6 IN LEVEL 3 FT DEEP x 4 FT WIDE, 100 FT TRENCH
BACKFILL ACCESS ROAD ROAD BASE ROAD	450 450	SY	6 2 15	300 900 6,750		20 FT MIDE BY 200 FT LOWG
SUBTOTAL					\$2,023,000	
10. SOIL VAPOR EXTRACTION - ECC						
PILOT TESTING SAMPLING PRIOR TO EXTRACTION 26 SOIL BORINGS SAMPLE COLLECTION VOC AMALYSIS WITH B/N EXTRACTION WELLS INLET WELLS CONNECTING PIPE BLOWER ASSEMBLY BLOWER ASSEMBLY	208 1 52 640 640 2000	LS EA LF	75000 40 8400 800 32 32 6 4100	75,000 8,320 8,400 41,600 20,480 20,480 12,000 41,000		
GAC SYSTEM FOR VAPOR CARBOM ADSORBER SYSTEM CARBOM TRANSFER TANK MATER HEATER PUMP AND PIPING MEAT EXCHANGER CMLORINATION SYSTEM		LS LS LS LS LS	200000 20000 9000 1000 13000	200,000 20,000 9,000 1,000 17,000 5,000	:	4 MDDULES & \$50,000 EACH 3.5 FEET DIA. % 8 FOOT HIGH

APPENDIA TARLE A-21

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS MITH RCRA CAP, ERCUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT
SOLL VAPOR EXTRACTION AT ECC

	;=========	========	:======	:===:	=======	BB268===================================
	\$58'202'000 !		į	<u> </u>		TOTAL CAPITAL COST
	====================================	920'000	; = = = = = = = = = = = = = = = = = = =		*********	EWGINEERING DESIGN COST
	•					14" ENEIMEERINE
	427,855,000					TOTAL IMPLEMENTATION COST
1	i !	220,000 1,300,000				SERVICES DURING CONSTRUCTION PERMITTING (5 %)
	İ					13. OTHER
	\$59,005,000		•			COMSTRUCTION TOTAL
	1 1 1 6 1 1	5,428,000 2,428,000 2,428,000 812,000	1			CODE CONTINGENCIEC (32 %) BID CONTINGENCIEC (12 %) MENTIN WID SWELL (12 %) MOBIFTYLION DENDRIFIZULION (2 %)
			:			15. CONTINGENCIES
	000*152*91\$					CONSTRUCTION SUBTOTAL
	\$118,000					JATOTAU2
1 GIEN ENEKK 120 EL' BYONE LENCE 9. CHAIN FINK MITH BARBED MINE	1	900'Z 000'b 009'III	22 5000 15	EA EA		ENCINE EVEL ENCINE
Y. CAVER 11MK MILT DVODED MIDE		007 111		31	0079	11. ACCESS RESTRICTIONS
	\$200,000					JATOTBU2
5 FT. DEEF X 2 FD0T WIDE X 900 FEET, DOUBLE FOR H&S		000°B 000°b 11°700 11°200	000B 000b 00711 51b	57 51 51 43		MOLEXCAVATION PIPING TO TREATMEN. ALL MONITORING ALL-TRATZ
	! !					DIRECT CAPITAL COSTS
SMOITAMUSSA	1503	JATOT	71MJ 331A9	TINU	YTTINAUG	MO119183230

1 3849 S2-6 323MT k15x3 P946

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS NITH FORM CAR, GROUNDWATER ISOLATION AND LEACHARTE COLLECTION AND TREATMENT SOLATION AND LEACHARTE COLLECTION AND TREATMENT

=:					====:		
		000,289,8\$					SUBTOTAL (TD NEAREST \$1000)
	HYDRAULIC SPREADER			50.0	3E	2254000	03320AQVH
	OMSITE TILL, EXCANATE, HAUL, BACKFILL		000'029	\$	LV.	154000	ESTARLISH VEGETATIVE COVER :
			1,480,000 1,480,000	2 :	; Y3	182000	RACKFILL Excavate 4 haur
	USE ONSITE SOLL (COMMON EARTH)						SAND LAYER
	20 MIL, PVC 2 LAYERS OF POLYPROPYLENE		000'999	. 2.1 1.6 !	AS	210000	SYNTEHTIC MEMBRANE GEOTEXTILE
		1	000,074,2	10	;	247000	EXCAVAIE & HAUL
	2 FT. THICK, COMPACTED				1 1	1	CLAY LAYER
			224,000	2 B	CA :		EXCANDIE 9 HAUL
7	1.5 FT. THICK SAND AND GRAVEL, COMPACTED		.,,	_			DRAILAND
	REPLACEMENT AT 30 YEARS						2. RCRA CAP REPLACEMENT
		\$384,000					SUBTOTAL (TO NEARES \$1000)
			000°0Z	50,000	57	1	RETROFIT EXPENSES
			000,14	000 11	51	į	SUSTRUMENTATION AND CONTROLS
			000'S	2,000	57	•	OTHER FIR COMPRESSOR
	AVERAGE PRICE OF TWO SYSTEMS		52,000	22,000	51	t	SRANULAR MEDIA FILTER
			000°Z	200	. YAG		AUTRAT2
į	V-SS 1300M		154,000	124,000	51	τ	PACT SYSTEM PACT PACKAGE
			****	445			4UTSAT2
- ;	SIEEL TANK		000'Z	005	. 190 57:	t	MAT MOTTASTLAN
	.J-PRESS, 15 CU FT FRP TANK		000,74	0021	S7 S7	1	SOLIDS STORAGE TANK
	SAVERAGE PRICE OF TWO SYSTEMS		000,81	000'BI	: ร้า:	Ţ	PRECIPITATION SYSTEM PACKAGE
	2 IN, IN-LINE MIXER		820	058	₩3	τ	PRECIPITATION SYSTEM
	H10 1 279 I F W 2140 C		12,200	00010	H3	7	34404
	100,000 GALLON EQUALITATION/STORAGE TANK Submersible fund		100,000	000,001 000,001	¥3 51	Ĭ	TWELUENT PUMPTING EQUAL IZATION/STORAGE
į							}
1	REPLACEMENT AT YEAR 15, FLOWRATE OF 5 GPM				:		I. TREATMENT PLANT
					:		YEPLACEMENT COSTS
	2NOTT9MU22A		JATOT		TINA	YTITMAUQ	DESCRIPTION

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL VAPOR EXTRACTION AT ECC

	: : PUANTITY					ASSUMFTIONS
DIRECT SPERATION AND MAINTENANCE COSTS						
1. MONITORING (\$/SAMPLING ROUND)	: : : :			FIRST YEAR	AFTER FIRST YEAR	OUARTEGLY FOR 1ST YR., SEMI-ANNUALLY THEREAFTER
NONITORING WELLS LABOR FOR MONITORING WELLS SUFFACE WATER SEDIMENT LABOR FOR SURFACE SAMPLES	8 8	EA DAY EA EA	1400 1000 1400 1600 600	229,600 24,000 22,400 25,600 1,200	30,800 12,000 22,450 25,500 1,200	FOR GROUNDWATER, DIHERS SENT-ANNUALLY 14 WELLS AFTER FIRST YEAR, \$1100/MELL 1 E1, 2 TECH'S & DAYS 11 E1, 1 TECH, 1 DAY, SENT-ANNUALLY
AIR QUALITY MOMITORING FIELD BLANKS GROUNDMATER SURFACE WATER SEDIMENT DUPLICATES	2 1 1 1	EA EA EA	700 1400 1400 1600	1,400 11,200 2,800 3,200	•	Hnu, OVa - 1 E3, 1 TECH, 1 DAY , SEMI-ANNUALLY
SECUNDUATER SURFACE MAYER SECUNENT SHIPPING CHARGES	2 1 1 1	EA :		11,200 2,800 3,200 8,000	2,800 3,200	\$1100/WELL AFTER 1 YEAR 3 SAMPLES/CODLER - \$100/CODLER
2. TREATMENT PLANT OPERATION (\$/YEAR) TREATMENT SYSTEM FLOW RATE @ 341 GPM FIRST 5 YEARS						
INFLUENT PUMPING ELECTRICITY	19600	kw-h	0.05	980		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DTSPOSAL CHEMICAL USAGE	6540 1770 1770		0.05 45 80	327 79,650 141,600		i.
FERROUS SULFATE: ALKALI (LIME) POLYMEN USAGE ACID USAGE	281 778500 2980 -MINIMAL-	LB :	2.11 0.05 3.35	593 38,925 9,983		AS FERROUS SULFATE HEPTAMYDRIDE 2 PPM PERCOL 776
PACT SYSTEM ELECTRICITY SOLIDS HAWEING SOLIDS DISPOSAL CARBON USAGE	253	kw-h TON TON LB	0.05 45 80 0.4	38,500 11,385 20,240 61,320		0.5 16 PAC/16 COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	164000	ku-h	0.05	8,200		
MAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES			30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
TREATMENT SYSTEM FLOW RATE @ 211 GPM - - YEARS 5 THROUGH 15						
INFLUENT FUMPING ELECTRICITY	19600	ku-h	0.05	980		
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAU: ING SLUDGE DISPOSAL CHEMICAL USAGE	6549 815 815		0.05 45 80	327 36.675 65,200		
FERROUS SULFATE ALKALI (LIME)	193 373800		2.11 0.05	407 18,590		AS FERROUS SULFATE HEPTANYDRIDE

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL VAPOR EXTRACTION AT ECC

DESCRIPTION	: QUANTITY			TOTAL	ASSUMPTIONS
DIRECT OPERATION AND MAINTENANCE COSTS					
POLYMER USAGE ACID USAGE	1840 -MINIMAL-		2.35	6,164	2 PPM PERCOL 776
PACT SYSTEM ELECTRICITY SCLIDS HAULING SOLIDS DISPOSAL CARBON USAGE		TON TON	0.05 45 80 0.4	38,500 3,240 5,760 12,120	0.5 1b FAC/1b COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	164000	ku-h	0.05	8,200	
MAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24		30 45 1400 100	93,960	A FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH SHIPMENTS PER MONTH
TREATMENT SYSTEM FLOW RATE 0 6 GPM - - AFTER 15 YEARS					
INFLUENT PUMPING ELECTRICITY	3270	ku-h	0.05	164	
PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL	: 75	kw-h TON TON	0.05 45 80	327 3,375 6,000	
CHEMICAL USAGE FERROUS SULFATE ALKALI (LIME ' POLYMER USAGE ACID USAGE	: 31800	LB	2.11 0.05 3.35	15 1,590 157	AS FERROUS SULFATE HEPTAHYDRIDE 2 PPM PERCOL 776
PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	26000 22 22 22 16400	TON:		1,300 990 1,760 6,560	0.5 16 PAC/16 COD
OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	33000	ku-h	0.05	1,650	
MAINTENANCE SUPERVISIOM MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24		30 45 1400 100	250,560 93,960 33,600 2,400	4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 22 SHIPMENTS PER MONTH
3. SOIL VAPOR EXTRACTION SYSTEM					
BLOWER ELECTRICITY AIR HONITORING	457000	ku#h	0.05	22,850	
KEY COMPONEMET AMALYSIS VOLATILE SCAM WITH BASE/MEUTRALS SAMPLING TRIP GRAMULAR ACTIVATED CARBON SYSTEM	1 40	EA EA DAYS	70 8 00 100	8.400 32,000 3,600	
CARBON REPLACEMENT CARBON HAULING CARBON DISPOSAL ELECTRICITY MATERIALS LAB ANALYSIS LABOR SUPERVISION		:TON :TON :kw+h : LS : LS	48000	189,000 2,835 5,040 6,209 48,900 1,000 31,290 4,590	
4. PUMP ELECTRICITY (\$/YEAR)		:			

PAGE 3 APPENDIX TABLE A-23

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH RORA CAF, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL VAPOR EXTRACTION AT ECC.

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	: : TOTAL	CúST	ASSUMFT LONS
	DIRECT OPERATION AND MAINTENANCE COSTS				! ! !		
	LEACHATE COLLECTION SYSTEM GROUNDWATER ISOLATION SYSTEM GROUNDWATER COLLECTION SYSTEM - ECC	1 1	LS LS LS	1000 8000 650	4,000		
5.	INSPECTION (\$/YEAR)	• • •			:		
	SITE INSPECTION	ı	LS	1806	3,600		I E1, 1 TECH, 3 DAYS, TWICE PER YEAR
٥.	OTHER MAINTENANCE (\$/YEAR)				;		
	GROUNDMATER/LEACHATE COLLECTION EXTRACTION MELLS - EJECTOR : 3PLACEMENT FRENCH DRAIN PUMP REPLACEMENT LEACHATE COLLECTION PUMP REPLACEMENT GROUNDMATER COLLECTION-ECC PUMP REPLACE REFURBISH MELL SCREENS	1	EA LS LS	1000 500	1,000		REPLACE ALL PUMFS EVERY 3 YEARS REPLACE EVERY 5 YEARS REPLACE EVERY 5 YEARS REPLACE EVERY 5 YEARS
	NOMITORING WELLS COLLECTION SYSTEM WELLS CAP REPAIRS		LS LS				CLEAN EVERY 10 YRS 2 MkS. LABOR, 2 PEOPLE CLEAN EVERY 10 YRS 4 MKS. LABOR, 2 PEOPLE
	EROSION CONTROL FREEZE/THAM REPAIRS SETTLEMENT REPAIRS FENCE MAINTENANCE HOMING	74 9400 1	AC AC CY LS AC	225 10 3600	16,650 94,000 3,600	:	FILL 2" SETTLEMENT OVER 502 OF LANDFILL YEARLY
= = =	CLEAN TILE SYSTEN LEACHATE COLLECTION SYSTEN - NSL GROUNDWATEN ISOLATION SYSTEN GROUNDWATER COLLECTION SYSTEM - ECC	5720 5500 5400	LE	0.5	2,850 2,750 2,700		CLEAM PIFÉLINE EVERY 5 YEARS

NOTES:

- DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE IN RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.
- 2. PACT CARBON SOLIDS ASSUM: TO BE DISPOSED OF IN RCRA LANDFILL. IF REGULATIONS REQUIRE INCINERATION ADDITIONAL COSTS ARE ASSUMED TO BE \$0.50 /1½ OF PACT CARBON SOLIDS COST (YEARS 1 TO 5): \$253,000 /YEAR COST (YEARS 5 TO 15): \$72,000 /YEAR COST (YEARS 15 TO 30): \$22,000 /YEAR

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 7: ACCESS RESTRICTIONS WITH ACRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL VAPOR EXTRACTION AT ECC

PRESENT MORTH (BASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST 4	COST \$	DISCOUNT RATE 10%	PRESENT Worth	ANNUAL O & M COSTS:						
0	62 8, 503, 000	\$1,685,715	0, 90909	\$28,503,000 \$1,532,467 \$1,203,902 \$1,099,178	ANNEAL COSTS	FIRST YEAR	AFTER FIRST		341 GPM -	ITREATMENT SYSTEM FLUW RATE &	6 GPW -
2		\$1,685,715 \$1,456,715 \$1,463,015	0.82645	\$1,203,902	I MONITORING (\$/SAMPLING ROUND)		YEAR			1	
3		\$1,463,015	0.75131	\$1,099,178	<u> </u>			I INFLUENT PUMPING		I INFLUENT PUMPING	
2		\$1,456,715 \$1,113,910	0. 683 01 0. 6209 2	\$994,951 \$691,649	1			ELECTRICITY	980	ELECTRICITY	164
š		\$893, 300	0.56447	\$504,241	MONITORING MELLS	229,600	30,800	PRECIPITATION SYSTEM		I PRECIPITATION SYSTEM	
7		\$893, 300 \$887, 000	0.51316	6455, 173	I LABOR - MONITORING HELLS	24,000	12,000		327		327
8		\$867, 000	0.46651	9413, 794	i surface water	22,400	22,400	I SLUDGE HAULING	79,650	I SLUDGE HAULING	3, 375
.9		\$893 , 300	0, 4241	\$378,849	I SEDIMENT	25,600	25,600	SLUGGE DISPOSAL	141,600	1 SLUDGE DISPOSAL	6,000
10		\$906, 910 \$887, 000	0. 38554 0. 35049	\$349,650 \$310, 86 5	I LABOR - SURFACE SAMPLES I AIR QUALITY MONITORING	1,200	1,200		593	I CHEMICAL USAGE I FERROUS SULFATE	15
11 12 13 14		\$893,300	0.31863	\$284,632	FIELD BLANKS	2, 400	2, 400	I ALKALI	38, 925		1,590
13		\$893,300 \$887,000	0.20966	\$256, 928	GROLNOHATER	11,200	4,400		9, 983	I POLYMER	157
14		\$887,000	0.26333	\$233, 574	SURFACE WATER	2,800	2,800		•	1	
15 16	\$399,000	\$905,210	0. 23939	9312,215	I SEDIMENT I DUPLICATES	3, 200	3,200	PACT SYSTEM	-a eaa	I PACT SYSTEM	. 255
17		\$714,000 \$714,000	0. 21763 0. 19784	\$155, 388 \$141, 258	I GROLDBIATER	11,200	4,400	ELECTRICITY SOLIOS HAULING	38,500 11, 38 5	I ELECTRICITY I SOLIDS HOLLING	1,300 990
18		\$720, 300	0.17986	4120 557	SURFACE WATER	2,800	2,800		20,240	I SOLIDS DISPOSAL	1,760
19		\$714,000	0. 16351	\$116,746	I SEDIMENT	3,200	3,200		61, 320	I CARBON USAGE	6,560
20		\$714,000 \$733,910 \$720,300	0.14864	\$116,746 \$109,088	I SHIPPING CHARGES	8,000	4,000	1	20,20	l .	5,55
21		1720, 300	0.13513	\$97, 334	1			I AIR COMPRESSOR		1 ATR COMPRESSOR	
19 20 21 22 23 24 25 26 27 28 29		\$714,000	0. 122 8 5	\$87,715	i S/YR	\$347,000	\$118,000	ELECTRICITY	8,200	ELECTRICITY	1,650
23		\$714,000 \$720,300	0. 111 68 0. 10153	\$79, 740 \$73, 132 \$67, 001				MAINTENANCE	250,560	MAINTENANCE	250,560
25		\$725, 910	0.0923	\$67,001	i			1 SUPERVISION	93, 960	SUPERVISION	93, 960
26		8714,000	0.08391	\$59, 912	İ			I EFFLUENT NUNITORING &	33,600	I EFFLUENT MONITORING	33,600
27		\$720, 300 \$714, 000	0. 07628	854, 944	!			I SANGLE SHIPPING CHARGES	2,400	I SAMPLE SHIPPING CHARGES	2,400
28		\$714,000	0.06934	\$49,509	ANNUAL COSTS (SAME EVERY YEAR, \$/YR)			DOCUMENTS COME	e300 000	PECBATING COUR	
30	\$8, 985, 000	\$714,000 \$740,210	0.06304 0.05731	\$45,011 \$557,352	INSPECTION	3,600		I OPERATING COST	\$792,000	I OPERATING COST	\$404,000
					GEN. NAINTENANCE	3,000		i		ISOIL VAFOR EXTRACTION SYSTEM	- ECC
OTAL O	IN PRESENT WORTH			\$10, 235, 000	CAP REPAIRS	127, 300		ITHEATMENT SYSTEM FLOW RATE #	211 GPM -	I FIRST 4 YEARS	i
					I FENCE MAINTENANCE	3,600		YEARS 5 TO 15			
OTAL RE	placement present	WURTH		\$610,000	I HOMING I PUMP ELECTRICITY	49,580	•	I INFLUENT PUMPING		I BLOMER ELECTRICITY I AIR MONITORING	22,850 (
NTO: 06	ESENT WORTH			\$39, 349, 000	LEACHATE COLLECTION SYSTEM	1,000		ELECTRICITY	980	I KEY COMPONENT ANALYSIS	8,400 I
uine re				vas, a 121 voo	I GROLINDHATER ISOLATION SYSTEM	6,000		i december	320		32,000
					I GROUNDWATER COLLECTION SYSTEM -ECC	650		I PRECIPITATION SYSTEM		I SAMPLING TRIP	3,600
OTES:					, TOTAL CHARGE GOOTS 12 (1500)			ELECTRICITY	327	I GRANLILAR ACTIVATED CARBON	
	N100000 OF DOC			DO LOMBETTI	i total annual costs (\$/year)	\$192,000		I SLUGGE HAULING	36,675	CARBON REPLACEMENT	189,000 1
1.	DISPOSAL OF PREC	THE CHINDSE DECI	MED TO BE REQUIR	EN LIMBOLICE.	NONONNAL MAINTENANCE (S/ACTIVITY)			1 SLUDGE DISPOSAL 1 CHENICAL USAGE	65, 200		2,835 5,040
	10 1 1 MITTER OF 1		MED 10 MC MC201.11		i manufacture manufacture (orner invitation)			FERROUS SULFATE	407	I ELECTRICITY	6,200 1
2.	IF INCINERATION	OF PACT SOLIDS	AT \$ 0.50 / LB.		I REFURBISH SCREENS (EVERY 10 YEARS)			I ALKALI	18,690	I MATERIALS	48,000
	IS REQUIRED, THE	ADDITIONAL PE	esent worth		I MONITORING WELLS	\$6,000		POLYMER	6, 164		1,000 (
	(MHICH IS NOT IN	CLUDED) IS:		\$1,201,000	COLLECTION SYSTEM WELLS	\$2,000		L CART CHETCH		I LABOR I SUPERVISION	31,200 1
	THE PRESENT WORT	u ac 140 0001	en the htennen		GROUNDWATER/LEACHATE COLLECTION			I FACT SYSTEM I ELECTRICITY		1 POLENATOTON	4,590
			RACTED FROM		I PUMP REPLACEMENT			I SOLIDS HAULING	38, 500 3, 240	I SUNTOTAL	. \$354,715 i
	THE TOTAL PRESEN	T MORTH IS:	moles (man	\$96,000	EJECTOR REPLACEMENT (EVERY 3 YEARS)	\$6,300		SOLIDS DISPOSAL	5, 760		. ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
				,) FRENCH DOGIN (EVERY 5 YEARS)	\$1,000		CARBON USAGE	12, 120		
			•		I LEACHATE COLLECTION (EVERY 5 YEARS)	\$500				!	
					FROUNDWATER COLLECT-ECC (EVERY 5 YRS)	\$2,100		I AIR COMPRESSOR	0 XA] [
					I CLEAN TILE SYSTEM (EVERY 5 YEARS) I LEACHATE COLLECTION SYSTEM	es aco		ELECTRICITY	8,200	1	
					I GROUNDMATER ISOLATION SYSTEM	\$2,860 \$2,750		MAINTENANCE	250, 560	i	
					I GROUNDHATER COLLECTION SYSTEM -ECC	\$2,700		I SUPERVISION	93, 960		
								EFFLUENT MONITORING	33,600	1	
								SAMPLE SHIPPING CHARGES	2,400	<u> </u>	
								I DESOTING COST	65.77 (NO)	1 1	
								PERATING COST	\$ 577,000	•	

APPENDIX TABLE A-25 PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RCKA CAP, SEQUENDMATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOLL INCINERATION AND CONSOLIDATION AT ECC

		JUIL INC.	MET COLI		DUDOCIDALION	WI CCC	
	DESCRIPTION	: QUANTITY			: TOTAL		ASSUMPTIONS
	DIRECT CAPITAL COSTS				•		
1.	REMOVE CREEK AND LEACHATE SEDIMENT			! ! ! !	t 1 1 5		
	EXCAVATE BACKFILL EXCAVATION	4200	CY	8	33,600		
	NATERIAL PLACEMENT ESTABLISH VEGETATIVE COVER	4000	CY	10 5	40,000 20,000		CLAY BACKFILL 1300 FT. HAUL, 4° LIFTS, 4 PASSES
	SOIL Hydroseed	61200	EY SF	0.03	34,000 1,836		ONSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
	SUBTOTAL				•	\$129,000	
2.	REROUTE FINLEY CREEK AND UNMANED DITCH		:		:		4300 FT. REROUTED
	EKCAVATE NEW CREEK BED RIPRAP	3255 540	CY	20 7 4	65,100 39,960		TILL, EXCAVATE AND HAUL (MET)
	SUBTOTAL					\$105,000	
3.	ECC SITE WORK		ĺ				
	REHOVE PROCESS BUILDING BUILDING REMOVAL FOUNDATION DEMOLITION BISPOSAL	108750 3625 360	CF SF CY	0.2 3.3 3.7	21,750 11,963 1,332		SINGLE BLDG, NO SALVAGE :CONCRETE SLÅB, REINFORCED I FOOT THICK DEMOLISHED BUILDING VOLUME AND FOM. VOLUME
	REMOVE CONCRETE PAD Demolition Disposal	30500 850	SF Cy	3 3.7	91,500 3,145		DEMOLISH CONCRETE PAD ASSUME 0.75 FEET THICK
	REMOVE CONTAMINATED SLUDGE/SOIL TESTING PRIOR TO EXCAVATION EXCAVATE TRUCK LINERS MAUL OFFSITE DISPOSAL & RCRA FACILITY REMOVE EXTRACTED CONTAMINATED SROUNDMAT	730 730		14000 3.4 200 43 80	14,000 £,205 7,400 31,390 58,400		BACKHOE EXCAY, & DOUBLED FOR H&S 225 MI HAUL, 730 CY
	HAUL DEFEITE TREATMENT & RCRA FACILITY	9000 9000	6AL 6AL	0.24 0.24	2,160 2,160		\$450/TRUCK, \$3.25/MILE, 225 MILES TO FACILITY TRUCK MANDLING AND TREATMENT
	SUBTOTAL,					\$251,000	
4.	MONITORING PROGRAM						i
	MONITORING WELLS 11 - UPPER GLACIAL TILL 13 - MID-BEPTH 2 - DEEP SAMD AND GRAVEL PIEZOMETERS	320 490 350	LF :	60 60 75	19,200 29,400 26,250		SHALLOW - HOLLOW STEM AUGER DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
	2 - UPPER GLACIAL TILL 2 - MID-DEPTH		LF :	90 90	2,400 4,200		SHALLOW - HOLLOW STEM AUGER
	SUBTOTAL					\$81,000	
5.	RCRA CAP CONSTRUCTION						
	PRELIMINARY GRADING FILL - EXCAVATE & HAUL FILL - BACKFILL DRAINAGE LAYER EXCAVATE & HAUL EXCAVATE & HAUL	213106 213100 113000 113006	CY	3	1,278,600 639,300 904,600	1	USE ONSITE SOIL (COMMUN EARTH) 1.5 FT. THICK SAND AND GRAVEL, COMPACTED
	BACKFILL CLAY LAYER EXCAVATE & MAUL BACKFILL	247000 247000		3 10 3			2 FT. THICK, COMPACTED

	ON		

46 BORINGS ON SO FT CENTERS SUMP PURFS HETRL, 4" DIA. RETAL, 4" DIA. RETAL, 4" DIA. RECAST CONC., MARHOLE, 6" ID, 16" DEEP		1,760	\$100 \$200 \$200 \$1 \$1 \$1 \$1 \$0*11 \$40 \$2000	: EA :	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	P. GROUNDWATER COLLECTION - ECC FREWCH DRAINS SOIL BORING FRIDR TO EXCAVATION SURING RND BRACTING DEWATER THENCH PERFORATE PIPE ERRORATE PIPE GONNECTIONS COLLECTION & RISER PIPE COLLECTION & RISER PIPE HET HELL SURP PUNP
	\$42 2 *000		ļ		:	TATOT8U2
4° DEEP, \$ DOUBLED FOR H & S METAL, 8° DIA, 16 GABE IN TRENCLASS SUMP, INCLUDES FUMPISIMPLEX) AND CONTROLS FIBERGLASS SUMP, 1 INCLUDES FUMPISIMPLEX) AND CONTROLS PRECAST CONC., 4° 10, 6° DEEP	1 1 1 1 1 1	2,20 4,20 262,20 24,320 10,693 20,520		72 52 11 17 12 13 13	54120 2450 2450 75400	EXCAVATE TRENCH CANACLE PROTECTIVE PERFORATE PROTECTIVE PERFORATE PROTECTIVE FRENCH BACKFILL STANDALES FRENCH BACKFILL STANDALES FRENCH BACKFILL FRENCH BACKFI
	<u> </u>					7. LEACHATE COLLECTION SYSTEM
	000,991,18					JATOTBUZ
METAL, 8° DIA.; 16 GAGE GRAVEL FILL, COMPACTED FIBERGLASS SUMP, INCLUDES PUMP(SIMPLEX) AND CONTROLS PRECAST CONC., 4° ID, 2S° DEEP		4 200 204 000 22 000	2.0 002h 21 6 71.0 71.0	V3 V3 L5 L5 25	3000	LINE TREMON FREWIDUS GEOTEXTILE PERVIOUS GEOTEXTILE GENOVEL BOXCF FLL SUMP PURP STATION
MODD SHEELING, WALES, BRACES LUMP PLUND SHEELING, WALES, BRACES		2,630	\$09 2	EV EV	50900 9 123100	SHORING AND BRACING DEMATERING EXCAVATE TRENCH
4 IN DIAMETER, METAL (ROUGH ESTIAMSE ON COST) METAL, 4 IN DIAMETER METAL ASSISTANCES, 4 PER MELL METAL ASSISTANCES, 4 PER MELL METAL ASSISTANCES, 4 PER MELL		000'9 12'500 11'000	2 200 42 2000 2000	EA :	2800 85	EJECTORS HEADER PIPE PUMPECTIONS VALVES CONLECTION PIPE TRENCH FOR PIPE FREIGH WAINS
WELL EJECTOR SYSTEM B IN DIANETER, AIR ROTARY DRILLED		232,800	. 09	31	2420	EXTRACTION WELLS INSTALL MELLS
TO 15DLATE LANDFILL FROM GROUMDMATER						6. GROUNDMATER ISOLATION AND COLLECTION
	110,903,000					TW10180S
ONSITE TILL, EKCANATE, HAUL, BACKFILL HYDRAULIC SPREADER			2 20.0	St. CA	2254000 154000	0335000AH 1105
		222,000	8 2	13 C1	182000	BACKFILL ESTABLISH VEGETATIVE COVER
TRE OMSILE SOLF (COMMON EARTH)		1,480,000	:	: :	182000	SAMP LAYER SAMP LAYER
20 MIC. PVE 2 LAYERS OF POLYPROPYLENE		000 '999	2.1 8.1	AS :	210000	SYNTENTIC MEMBRANE
						DIRECT CAPTIAL COSTS
SKOTTAMUSSA		16101			YTITMAUD:	DESCRIPTION
- anastanuma	1303		TIMU		VI I THAILD	MCC010110W

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RORA CAP, BROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT
SOLE INCINERATION AND CONSOLIDATION AT ECC

APPENDIX TABLE A-25

APPENDIX TABLE A-25 FAGE 3

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RCKA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL INCINERATION AND CONSOLIDATION AT ECC

	SOIL INCI	NERAT	ION AND C	ONSOLIDATION	AT ECC	
DESCRIPTION	: QUANTITY :======			: TOTAL		: ASSUMATIONS
DIRECT CAPITAL COSTS				:		
SUBTOTAL	! ! !		: :	i	\$507,000	
9. GROUNDMATER/LEACHATE TREATMENT				•		DESIGN RATE OF 341 GPM
INFLUENT PUMPING EDNALIZATION/STORAGE PUMPS		LS EA	100,000	160,000 13,200		: 100,000 GALLON EQUALIZATION/STORAGE TANK SUBMERSIBLE PUMP
PRECIPITATION SYSTEM IN-LINE NITER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK NEUTRALITATION TANK PILOT TESTING STARTUP			1,550 134,000 47,000 2,000 4,300 5,000	1,550 134,000 47,000 2,000 4,300 5,000 2,500		4 IN. IN-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS 13-PRESS, 15 cu ft FRP TANA STEEL TANK
PACT SYSTEM PACT PACKAGE FILTER PRESS PILOT TESTING STARTUP	1 1	LS LS LS	715,000 47,000 20,000 500	715,000 47,000 20,000 2,000		HODEL 55-A 13-PRESS, 15 cu ft
GRANULAR MEDIA FILTER	1	LS	95,000	95,000		AVERAGE PRICE OF TWO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS BUILDING	1 1 30000	LS LS SF	16,000 41,000 25	16,000 41,000 750,000		٠
SITE MORK SITE PREPARATION CLEARING GRADING LEVELING	2200 6700 1100	ISY	4 1 3	8,800 6,700 3,300		SITE AREA: 300 FT X 200 FT, 1 FT DEPTH, 6 IN LEVEL
SITE DRAIMAGE ENCAVATION PIPE BACKFILL	50 100 50	:LF	4 6	200 600 300		3 FT DEEP X 4 FT MIDE, 100 FT TRENCH
ACCESS ROAD ROAD BASE ROAD	450 450	SY	2 15	900 6,750		20 FT WIDE BY 200 FT LONG
SUBTOTAL					\$2,023,000	
10. SDIL INCINERATION - ECC EQUIPMENT INSTALLATION AND STARTUP OPERATION	1 1 22000	LS LS CY	3550000 3050000 700	3,550,000 3,050,600 15,400,000		ROTARY KILM SYSTEM
SUBTOTAL					\$22,000,000	
11. ACCESS RESTRICTIONS						
FENCING GATE SIGNAGE	9300 2 62	LF EA	12 2000 33	111,600 4,600 2,04s		6 CHAIN LINK WITH BARBED WIRE 1 SIGN EVERY ISO FT. ALONG FENCE
SUBTOTAL			/"	2,010	\$118,000	STERN 190 11. REGING LENGE
CONSTRUCTION SUBTOTAL		: :			\$37,751,000	

PAGE 4

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE B: ACCESS RESTRICTIONS WITH RCRA CAP, SHOUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL INCINERATION AND CONSOLIDATION AT ECC

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST	ASSUMPTIONS
DIRECT CAPITAL COSTS	- -				
12. CONTINGENCIES					
MOBILIZATION/DEMOBILIZATION (5 %) MEALTH AND SAFETY (15 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (25 %)				1,888,000 5,663,000 5,663,000 9,438,000	
CONSTRUCTION TOTAL				\$60,403,000	
13. OTHER					
PERMITTING (5 %) SERVICES BURING CONSTRUCTION				3,020,000 1,000,000	
TOTAL IMPLEMENTATION COST				\$64,423,000	
14. ENGINEERING	:				
ENGINEERING DESIGN COST	.;			2,000,000	
TOTAL CAPITAL COST	1,2222222			\$66,423,000	

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APPENDIX TABLE A-26 PAGE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RORA CAF, GROUNDWATER ISOLATION AND LEACHATE COLLECTION AND TREATMENT SOIL INCINERATION AND CONSOLIDATION AT ECC

DESCRIPTION	QUANTITY	: :UNIT	UNIT PRICE	: TOTAL CO	nst	ASSUMPTIONS :
	=======================================	2222	########	=======================================		
REPLACEMENT COSTS						
1. TREATMENT PLANT						REPLACEMENT AT YEAR 15, FLOWRATE OF 5 GPM
INFLUENT PUMPING EQUALIZATION/STORAGE PUMPS	1 2	LS EA	100,000 6,600	190,000 13,200		190,000 BALLON EQUALIZATION/STORAGE TANK SUBMERSIBLE PUMP
PRECIPITATION SYSTEM IN-LIME MIXER PRECIPITATION SYSTEM PACKAGE FILTER PRESS SOLIDS STORAGE TANK MEUTRALIZATION TANK STARTUP	1	EA LS LS LS LS LS	850 18,000 47,000 1,200 1,800 500	850 18,000 47,000 1,200 1,800 2,000		2 IN. IN-LINE MIXER AVERAGE PRICE OF TWO SYSTEMS J-PRESS, 15 CU FT FRP TANK STEEL TANK
PACT SYSTEM PACT PACKAGE STARTUP	1	LS Day	124,000 500	124,000 2,000		MODEL 55-A
GRANULAR MEDIA FILTER	1	LS	23,000	23,000		AVERAGE PRICE OF THO SYSTEMS
OTHER AIR COMPRESSOR INSTRUMENTATION AND CONTROLS	ł	LS LS	5,000 41,000	5,000 41,000		
RETROFIT EXPENSES	1	LS.	20,000	20,000		
SUBTOTAL (TO NEAREST \$1000)					\$399,000	
2. RCRA CAP REPLACEMENT						REPLACEMENT AT 30 YEARS
DRAINAGE LAYER ELCAVATE & HAUL BACKFILL CLAY LAYER	113000 113000		, B	904,000 339,000		1.5 FT. THICK SAND AND GRAVEL, COMPACTED 2 FT. THICK, COMPACTED
EXCAVATE & HAUL BACKFILL GEOTEXTILE SYNTENTIC MEMBRANE	247000 247000 740000 370000	CY :	10 3 1.5 1.8	741,000		2 LAYERS OF POLYPROPYLENE 30 MIL. PVC
SAND LAYER EXCAVATE & MAUL BACKFILL ESTABLISH VEGETATIVE COVER	185000 185000	CY	3	1,480,000 555,000		USE ONSITE SOIL (COMMON EARTH)
SOIL Hydroseed	124000 3329000	CY SF	0.03	620,000 99,870		ONSITE TILL, EXCAVATE, HAUL, BACKFILL HYDRAULIC SPREADER
SUBTOTAL (TO NEAREST \$1000)		; ; ; ;		************	\$8,985 ,000	

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COMBINED ALTERNATIVE ALALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH ACRA CAP, ORGUNDMATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL INCINERATION AND CONSOLIDATION AT ECC.

			oc. 1011. 1011 11		
					ASSUMPTIONS
- :			! !		
-			FIRST	AF TES	
			YEAR	FIRST YEAR	:
					GUARTERLY FOR 1ST YR., SEMI-ANNUALLY THEREAFTER : FOR GROUNDMATER, CTMERS SEMI-ANNUALLY
			219,600 24,600 22,400	12,600 22,400	14 WELLS AFTER FIRST YEAR, \$1100/MELL 1 E1, 2 TEEH'S 6 DAYS
8	EA :	1600 600	1,200	1.200	il El. 1 (ECH. 1 DAY . SENI-ANNUALLY
:	: :				Hnu, OVa - 1 E3, 1 TECH, 1 DAY , SEMI-ANNUALLY
1	: EA :	1400	2,800	2,800 3,700	\$1100/WELL AFTER 1 YEAR
2	EA	1400	:	4,400	: \$1100/MELL AFTER 1 YEAR
1 1	EA :	1600	2,800 3,200	3,200	;
	1.5	2000	8,000	4,000	3 SAMPLES/CODLER - \$100/CODLER
19600	kw-h	0.05	980		ţ.
1 1770	:TON :				•
		2.11 0.05	593 38.925		AS FERROUS SULFATE HEPTAHYDRIDE
2980	LB :	3.35	9,983		2 PPM PERCOL 776 ·
253 253	:TON : :TON :	45 80	38,500 11,385 26,240		
153300	LB	0. 4	61,329		io.5 lb PAC/16 COD
164000	kw-h	0.05	8,200		
2088	HR :	30 45	250,560 93,960		4 FULL TIME OPERATORS FULL TIME SUPERVISOR
		100	2,400		INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
1					
19600	kw-h	0.05	9 30		
			727		
		45 80	35.275 65,10°		
		2.11 0.05	407 18,590		AS FERROLS SULFATE AEFTANYORIGE
	19600 19600 19600 19700 2980 -HINIMAL- 770000 253 253 153300 164000 8352 2088 24 24 24	GUANTITY UNIT	19600 Em-h 0.05	GUANTITY UNIT PRICE TOTAL	CHANTITY

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RCHA CAF, GROUNDWATER ISSLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SCIL INCINERATION AND LONGOLIDATION AT ECC.

*==		QUANTITY					ASSUMPTIONS
	DIRECT OPERATION AND MAINTENANCE COSTS	, 4 4 1					
	POLYMER USAGE ACID USAGE	1840 -MINIMAL-		3.35	٤,164		2 PFM PERCOL 776
	PACT SYSTEM ELECTRICITY SOLIOS HAWLING SOLIOS HAWLING SOLIOS HAWLING LARANN USAGE	770000 72 72 72 30300	: TON :	0.05 45 80 0.4	38,500 3,240 5,760 17,120		0.5 16 PAC/16 COD
	OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	164000			8,200		
	NAINTEMANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24		30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE ONCE PER MONTH 2 SHIPMENTS PER MONTH
	TREATMENT SYSTEM FLOW RATE & 5 5PM - - AFTER 15 YEARS	; 1 1 4 4					
	INFLUENT PUMPING ELECTRICITY	3270	kw-h	0.05	164		
	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE OLSPOSAL CLEMICAL MERCE	75	Lw-h Ton Ton	0.05 45 80	327 3,375 6,000		
	CHENICAL USAGE FERROUS SULFATE ALKALT (LIME) POLYMER USAGE ACID USAGE	7 31800 47 -HINIMAL-	:18	2.11 0.05 3.35	1,590 157	:	AS FERROUS SULFATE HEPTAHYDRIDE 2 PPM PERCOL 776
	PACT SYSTEM ELECTRICITY SOLIDS HAULING SOLIDS DISPOSAL CARBON USAGE	26000 22 22 22 16400	TON:	0.05 45 60 0.4	1,700 790 1,760 6,560		0.5 16 PAC/16 COD
	OTHER EQUIPMENT AIR COMPRESSOR - ELECTRICITY	33060	kw-h	0.05	1,450	i 1	
	MAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	8352 2088 24 24	:HR :EA	30 45 1400 100	250,560 93,960 33,600 2,400		4 FULL TIME OPERATORS FULL TIME SUPERVISOR INFLUENT AND EFFLUENT SAMPLE UNCE FER MONTH 2 SHIPMENTS PER MONTH
3.	PUMP ELECTRICITY (\$/YEAR)						
	LEACHATE COLLECTION SYSTEM GROUNDWATER ISOLATION SYSTEM GROUNDWATER COLLECTION SYSTEM - ECC	1	LS LS LS	1000 5000 650	1,000 5,000 650	; ; ; ;	
4.	INSPECTION (\$/YEAR)		:				•
	SITE INSPECTION	1	LS	1800	0,690		1 E1, 1 TECH, 7 DAYS, TWICE PER YEAR
5.	OTHER MAINTENANCE (\$/YEAR)						
	GROUNDMATER/LEACHATE COLLECTION ELTRACTION WELLS - EJECTOR REPLACEMENT FRENCH DRAIN FUMP MEPLACEMENT LEACHATE COLLECTION FUMP REPLACEMENT GROUNDMATER COLLECTION-ECC FUMP REPLACE REFURBISM WELL SCREENS	1 1 1	EA LS LS	2100 1006 500 2100	5,300 1,500 500 1,100	:	REPLACE ALL FUMFS EVERY I YEARS REPLACE EVERY 5 (EARS REPLACE EVERY 5 (EARS REPLACE EVERY 5 (EARS

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH REFA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL INCIMENATION AND CONSOLIDATION AT ECC.

DESCRIPTION	QUANTITY	TINU	UNIT PRICE	TOTAL COST	ASSUMPTIONS
DIRECT OPERATION AND MAINTENANCE COSTS		:	! !		
NONITORING WELLS COLLECTION SYSTEM WELLS CAP REPAIRS EROSION CONTROL FREEZE/THAN REPAIRS SETTLEMENT REPAIRS FENCE MAINTENANCE HOWING CLEAN TILE SYSTEM LEACHATE COLLECTION SYSTEM - NSL GROUNDMATER ISOLATION SYSTEM GROUNDMATER COLLECTION SYSTEM	74 74 74 9400	LS AC LF LF	2000 225 10 3600 670 0.5	2,000 16,450 16,650 94,000 3,600 49,580	CLEAN EVERY 10 YRS 2 MKS. LABOR, 2 PEOPLE CLEAN EVERY 10 YRS 4 MKS. LABOR, 2 PEOPLE FILL 2" SETTLEMENT GVER 50% OF LANDFILL YEARLY CLEAN PIPELINE EVERY 5 YEARS

NOTES:

DISPOSAL OF PRECIPITATION SLUDGE ASSUMED TO BE IN RCRA LANDFILL. NO FIXATION OF THE SLUDGE ASSUMED TO BE REQUIRED.

2. PACT CARBON SOLIDS ASSUMED TO BE DISPOSED OF IN RCRA LAMOFILL. IF REGULATIONS REQUIRE INCINERATION ADDITIONAL COSTS ARE ASSUMED TO BE \$0.50 /1b OF PACT CARBON SOLIDS COST (YEARS 1 TO 15): \$253,000 /YEAR COST (YEARS 15 TO 15): \$77,000 /YEAR 27,000 /YEAR 22,000 /YEAR 22,000 /YEAR

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 8: ACCESS RESTRICTIONS WITH RCRA CAP, GROUNDWATER ISOLATION/COLLECTION, LEACHATE COLLECTION AND TREATMENT SOIL INCINERATION AND CONSOLIDATION AT ECC

PRESENT WORTH (BASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	C051 \$	COST #	DISCOUNT RATE 101	WORTH	ANNUAL O & M COSTS:						
0	\$66,423,000	\$1,331,000	0.90909	\$66,423,000 \$1,209,999 \$910,748	ANNUAL COSTS MONITORING (\$/SAMPLING ROUND)	FIRST Y EA R	AFTER FIRST	TREATMENT SYSTEM FLOW RATE &	341 GPM -	TREATMENT SYSTEM FLOW RATE &	6 SPM -
3 4 5		\$1,102,000 \$1,108,300 \$1,102,000	0.82645 0.75131 0.68301 0.62092	\$832,677 \$752,677 \$691,649	MUNICIPAL TO SHIP ETRO ROUNDY		ILM	INFLUENT PUMPING ELECTRICITY	980	INFLUENT PUMPING ELECTRICITY	11
6 7 8 9		\$1,113,910 \$893,300 \$887,000 \$887,000 \$893,300 \$904,910 \$887,000 \$893,300 \$887,000	0.56447 0.51316 0.46651 0.4241 0.38554	\$504,241 \$455,173 \$413,794 \$378,849 \$349, <u>650</u>	MONITORING MELLS LAGOR - MONITORING MELLS SURFACE MATER SEDIMENT LAGOR - SURFACE SAMPLES AIR QUALITY MONITORING FIELD BLANKS GROUNDMATER SURFACE MATER SEDIMENT DUPLICATES EFORUMBATER	229,600 24,000 22,400 25,600 1,200	30,800 12,000 22,400 25,600 1,200	PRECIPITATION SYSTEM ELECTRICITY SLUDGE HAULING SLUDGE DISPOSAL CHEMICAL USAGE	79,250 141,600	PRECIPITATION SYSTEM ELECTRICITY SLUDGE MADEINS SLUDGE SISPOSAL CHEMICAL USAGE FERROUS SULFATE ALKALI POLYMER	7,53 3,6
11 12 13 14		\$887,000 \$893,300 \$887,000 \$887,000	0.35049 0.31863 0.28966 0.24333	\$310,885 \$284,632 \$256,928 \$273,574	AIR DUALITY MONITORING FIELD BLANKS SROUNDMATER SUPERFE MATEG	1,400 11,200	1,400 4,400 2,960	FERROUS SULFATE ALKAL! FOLYMER	38,925 9,983	FERROUS SULFATE ALKALT POLYMER	i, <u>:</u>
15 16 17 18 19	\$399,000	\$905,210 \$714,000 \$714,000 \$720,300 \$714,000	0.23939 0.21763 0.19784 0.17986 0.16351	\$129,553 \$116,746	SEDIMENT DUPLICATES GROUNDWATER SUFFACE WATER SEDIMENT SHIPPING CHARGES	3,200 11,200 2,800 3,200	3,260 4,460 2,800 3,200	FACT SYSTEM ELECTRICITY SOLIDS MANUFING SOLIDS DISPOSAL CARBON USAGE	38,500 11,385 20,240 61,320	PACT SYSTEM ELECTRICITY 50LIDS HAULING 50LIDS DISPUSAL CAABUN USAGE	1, 10 5,5 1,7; 5,5;
20 21 22		\$733,910 \$720,300 \$714.000	0.14864 0.13513 0.12285	\$109,088 \$97,334 \$67,715 \$79,740	SHIPPING CHARGES \$/YR	8,000 #347,000	4,000 \$118,000	AIR COMPRESSOR ELECTRICITY			
20 21 22 23 24 25 27		\$714,000 \$720,300 \$725,910 \$714,600 \$720,300 \$714,000	0.0 ²² 91 0.07428	\$73,132 \$67,001 \$59,912 \$54,944	ANNUAL COOTS (CAME FUERY WEAR A LVE)			MAINTENANCE SUPERVISION MONITORING SAMPLE SHIPPING CHARGES	250,560 4 93,960 33,600 2,400	MAINTENANCE SUFERVISION MONITORING SAMPLE SHIFFING CHARGES	25, 5 33, 5 23, 5
28 29 30	\$8,985,000	\$714,000 \$714,000 \$740,210	0.06934 0.06304 0.05731	\$49,509 \$45,011 \$557,352	ANNUAL COSTS (SAME EVERY YEAR, \$/YR) INSPECTION	3,600		OPERATING COST	\$792,000	OPERATING COST	1404.
AL OLI	H PRESENT WORTH			\$9,111,000	: GEN. MAINTENANCE : CAP REPAIRS : FENCE MAINTENANCE	127,300		: TREATMENT SYSTEM FLOW RATE & SEARS 5 TO 15	21! GPM -		
AL REI	PLACEMENT PRESENT	WORTH		\$610,000	MOWING FUMP ELECTRICITY	49,580		INFLUENT PUMPING	00:		
AL PKI	ESENT WORTH			\$76,144,000	SROUNDWATER ISOLATION SYSTEM SROUNDWATER COLLECTION SYSTEM SROUNDWATER COLLECTION SYSTEM -ECC	1,000 6,000 650		PRECIPITATION SYSTEM	980		
ES: 1.	DISPOSAL OF PREC	IPITATION SLUD HE SLUDGE ASSU	GE TO BE IN A RC NED TO BE REQUIR	RA LANDFILL. ED.	TOTAL ANNUAL COSTS (\$/YEAR) NOMANNUAL MAINTENANCE (\$/ACTIVITY)	\$192,000		ELECTRICITY SLUDGE HAU: ING SLUDGE DISPOSAL CHEMICAL USAGE	327 36,675 65,200		
2.	IF INCINERATION IS REQUIRED, THE UNHICH IS NOT IN	GF PACT SOLIDS ADDITIONAL PR CLUDED) IS:	AT \$ 0.50 / LB. ESENT WORTH	\$1,201,000	REFURBISH SCREENS (EVERY 10 YEARS) MONITORING WELLS COLLECTION SYSTEM WELLS	\$8,000 \$2,000		FERROUS SULFATE ALTALI POLYMER	407 18,690 6,1c4		
	THE PRESENT MORT IN A RORA LANDFI THE TOTAL PRESEN	H OF THE PACT: LL, TO BE SUBTI T WORTH IS:	SOLIDS DISPOSAL RACTED FROM	\$95 ₁ 000	ANNUAL COSTS (SAME EVERY YEAR, \$/YR) INSPECTION SEN. MAINTENANCE CAP REPAIRS FENCE MAINTENANCE NOMING PUMP ELECTRICITY LEACHATE COLLECTION SYSTEM GROUNDWATER ISOLATION SYSTEM GROUNDWATER COLLECTION SYSTEM OMANNUAL MAINTENANCE (\$/YEAR) NOMANNUAL MAINTENANCE (\$/ACTIVITY) REFURBISH SCREENS (EVERY 10 YEARS) MONITORING WELLS COLLECTION SYSTEM WELLS GROUNDWATER/LEACHATE CGLLECTION PUMP REPLACEMENT EJECTOR REPLACEMENT (EVERY 7 YEARS) FRENCH DREIN (E/FRY 5 YEARS) LEACHATE COLLECTION (EVERY 5 YEARS) GROUNDWATER COLLECTION SYSTEM GROUNDWATER COLLECTION SYSTEM GROUNDWATER COLLECTION SYSTEM GROUNDWATER (SYSTEM EVERY 5 YEARS) LEACHATE COLLECTION SYSTEM GROUNDWATER LORLECTION SYSTEM GROUNDWATER LORLECTION SYSTEM GROUNDWATER LORLECTION SYSTEM	\$6,300 \$1,600 \$500		ELECTRICITY SOLIDS HAULING SOLICS DISFESAL CARBON USAGE	38,500 2,540 5,760 12,120		
					GROUNDWATER COLLECTION (EVERY 5 YEARS) CLEAN TILE SYSTEM (EVERY 5 YEARS)	\$2,100		ATA COMPRESSOR ELECTRICITY	8,200	1 1	
					GROUNDWATER ISOLATION STSTEM GROUNDWATER ISOLATION SYSTEM GROUNDWATER COLLECTION SYSTEM -SCC	\$2,750 \$2,760		MAINTENANCS SUPERVISION MONITORING	250,5a0 97,7e0 23,500 2,4c0	• •	

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APPENDIX TABLE A-29 FASE 1

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH RCRA LANDFILL

DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL		ASSUMPTIONS
DIRECT CAPITAL COSTS				! !		
1. REMOVE CREEK AND LEACHATE SEDIMENT						
EXCAVATE RACXFILL EXCAVATION	4200	CY	8	33,600		EXCAVATE SAND & GRAVEL (MET)
BACKFILL EXCAVATION MATERIAL PLACEMENT ESTABLISH MESSEXATURE COMER	4000 4000	CA	10 5	40,000 20,000		CLAY BACKFILL 300' HAUL, 4" LIFTS, 4 PASSES
ESTABLISH VEGETATIVE COVER SOIL Hybroseed	6800 61200	CY SF	0.03	34,000 1,836		ONSITE TILL, EXCAVATE, MAUL, BACKFILL HYDRAULIC SPREADER
SUBTOTAL			•	:	\$129,000	
2. REROUTE FINLEY CREED AND UNNAMED DITCH				•		4300 FT. REROUTED
EXCAVATE NEW CREEK BED RIPRAP	3255 540	CY	20 74	65,100 39,940		ITILL, EXCAVATE AND HAUL
SUBTOTAL	•	<u>.</u>		!	\$105,000	
3. MONITORING PROGRAM						
MONITORING MELLS 11 - Upper Glacial Till	320		60	19,200		SHALLOW - HOLLOW STEM AUGER
13 - NID-DEPTH 2 - DEEP SAMD AND GRAVEL	490 350		60 75	29,400 26,259		DEEP, DOUBLE CASING, TILL WELL ADJACENT TO N. DEEP WELL
PIEZOMETERS 2 - UPPER GLACIAL TILL 2 - NID-DEPTH	40 70	LF LF	60 60	2,400 4,200		SHALLOW - HOLLOW STEM AUGER
SUBTOTAL					\$81,000	
4. CONSTRUCTION OF RCRA LANDFILL	•		•	j 1 1		
A. SITE PREPARATION	•			:		
CLEAR & GRUB MOODS CLEAR MEDIUM BRUSH EICAVATION PRELIN. SITE GRADING COMPACT SUBGRADE	25 430000 1900000 430000 280000	SY	1250 0.36 3.43 0.71 1.81	31,250 154,800 6,517,000 305,300 506,800		EQUIVALENT OF 25 ACKES OF WOODED AREA OVER SITE EXCAVATION FROM DTM PROGRAM, ELEV 900 FINE GRADE THREE PASSES
B. BERM CONSTRUCTION		:			\$7,515,000	
FILL REQUIRED VOLUME AVAILABLE VOLUME (FROM EXCAV) IMPORT VOLUME PLACE AND COMPACT	-52000 1800000	CY CY		4,950,000		THESE VALUES ARE FROM A CUT AND FILL CALCULATION PROGRAM, DTM
TOPSOIL H yaros eedi n g Subtotal	1260000	CY SF	0.03	235,000 37,800	\$4,674,000	FESCUE, HYDRAULIC SPREADER
C. RCRA MULTILAYER LINER					41,011,000	
1 FT. SAND EICAVATE & HAUL BACKFILL 2 FT. CLAY	86000 86000	CY CY	8	698,000 258,000		
EXCAVATE & HAUL BACKFILL GEOTEXTILE SYMTHETIC MEMBRANE LEAK DETECTION, COLLECTION SYSTEM	210000 210000 620000 310000 88000	CY CY SY SY SY	10 3 1.5 1.8 0.80	2,100,000 630,000 930,000 558,000 68,800		TREVIRA 30 mil PvC
1 FT. SAND EXCAVATE & HAUL BACKFILL	86000 86000		B 3	688,000 258,000		

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APPENDIX TABLE A-29

COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH RCRA LANDFILL

DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL		ASSUMPTIONS
DIRECT CAPITAL COSTS		:		! !		
GEOTEXTILE SYNTHETIC MEMBRANE LEACHATE COLLECTION, REMOVAL SYSTEM 1 FT EXCAVATE & MAUL	310000 86000	SY SY Ac	1.5 1.8 1.80	930,000 558,000 154,800		TREVIRA 30 mil PVC
EICAVATE & HAUL BACKFILL SUBTOTAL D. MOVE EXISTING CONTAMINATED SPIL AND LANDFILL CONTENTS	86000 86000	CY	3	688,000 258,000	\$8,768,000	ADD 30 % TO HANDLING COSTS FOR HES
MOBILE TESTING LAB EXCAVATION TRANSPORTATION PLACEMENT/COMPACTION SUBTOTAL E. BACKFILL EXCAVATED LAMPFILL	4100000	LS CY CY	8000 1.4 2 1.6	8,000 5,740,000 8,200,000 6,560,000	\$20,508,000	FRONT-END SETUP COST. USE EPA EGUIPMENT 12.5 CV FRONT END LOADER (1 DOZER PER LOADER) 120 CV DUMP TRAILER SMEEPSFOOT ROLLER (1 DOZER PER 2 ROLLERS)
BACKFILL LANDFILL TO LINER ELEVATION BACKFILL SITE OF SOIL EXCAVATION BACKFILL TOPSOIL NYDROSEED SUBTOTAL	280000 1700000 56467 1524600	CY CY CY SF	6 5 0.03	1,680,000 10,200,000 282,333 45,738	\$12,268,600	COMMON FILL TO ELEVATION 910 FILL TO EXISTING ELEVATION, SOUTH SIDE OF LANDFILL CONNON FILL FESCUE, HYDRAULIC SPREADER
F. RCRA MULTILAYER CAP DRAINAGE LAYER EXCAVATE & HAUL BACKFILL CLAY LAYER	96000 96000	CY	2 8	768,000 288,000		1.5 FT. THICK SAND AND GRAVEL, COMPACTED
EXCAVATE & HAUL BACKFILL BEDTEXTILE SYNTENTIC MEMBRAME SAND LAYER EXCAVATE & HAUL	190000 188148 580000 290000	CY CY SY SY	10 3 1.5 1.8	1,900,000 564,444 870,000 522,000 768,000		2 LAYERS OF POLYPROPYLENE 30 MIL. PVC USE ONSITE SOIL (COMMON EARTH)
BACKFILL ESTABLISH VEGETATIVE COVER TOPSOIL HYDROSEED SUBTOTAL	96000 96000 2610000	CY CY SF	3 0.03	288,000 480,000 78,300	\$6,527,000	OMSITE TILL, EXCAVATE, HAUL, AND BACKFILL FESCUE, HYDRAULIC SPREABER
RCRA LAMOFILL SUBTOTAL					\$60,200,000	
5. ACCESS RESTRICTIONS FENCING BATE STEMAGE		LF EA EA	12 2000 33	104,400 4,000 1,980		6' CHAIN LINK MITH BARBED WIRE I SIGN EVERY ISO FT. ALONG FENCE
SUBTOTAL Construction subtotal				·	\$110,000 \$60,625,000	
6. CONTINGENCIES MOBILIZATION/DEMOBILIZATION (7 %) HEALTH AND SAFETY (5 %) BID CONTINGENCIES (15 %) SCOPE CONTINGENCIES (35 %)				4,244,000 3,031,000 9,094,000 21,219,000		
CONSTRUCTION TOTAL 7. OTHER	,				\$98,213,000	

		000'428'401\$, ====================================	TOO LATIAL CAFITAL COST
		000,000,	1		,	ENGINEERING DESIGN COST
						8° EMEIMEERING
		\$102,824,000	į			TOTAL THPLEMENTATION COST
		000,119, 000,007	,			PERNITTIMS (5 Z) PERNITTIMS (5 Z) PERNITE BURING (5 Z)
-						DIRECT CAPITAL COSTS
	2MDIT MIJZZA	101AL C051	PRICE	1100	YTITMAUQ	MO11913230

COMBINED WILLIAM WITH MANAYIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH RCKA LANDFILL

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APPENDIX TABLE A-29

APPENDIX TABLE A-30

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COMPIMED ALTERNATIVE AMALYSIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH RORA LANDFILL

KEPLACENENT AT 30 YEAKS 1.5 FT. THICK, COMPACTED 2 FT. THICK, COMPACTED 30 MIL. PVC 10SETTE TILL, EXCAVATE, HAUL, AND BACKFILL FESCUE, HYDRAULIC SPREADER	\$6,000,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,000 \$1,90	2 0-02	ZŁ CA CA ZA ZA CA CA	000019Z 00096 00096 00096 00006Z 00008C 8+1881 000061 00096	REPLACENENT COSTS 1. RCBA MULTILAYER CAP REPLACEMENT CLAY LAYER CLAY LAYER CLAY LAYER CLAY LAYER CLAY LAYER SAMUE THE HAUL SAMUENTILE ESTRAILS HAUL BACKY ILL ESTRAILS HAUL ESTRAILS SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE ESTRAILS HAUL SAMUENTILE S
SNOT LAWNSSV	1203 JAT01	UMIT PRICE	MII	YTTTMAUQ	MOTTGERSZEG

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APPENDIX TABLE A-31

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH UNSITE RCRA LANDFILL

DESCRIPTION	: QUANTITY	:UNIT:		TOTAL	COST	ASSUMPTIONS
DIRECT OFERATION AND NAINTENANCE COSTS						
1. HOMITORING (\$/SAMPLING ROUND)	: : : : : :			FIRST Year	AFTER FIRST YEAR	GUARTERLY FOR IST VR., SEMI-ANNUALLY THEREAFTER
MONITORING WELLS LABOR FOR MONITORING WELLS SURFACE WATER SEDINENT	. 6 8	EA DAY EA EA	1000 1400 1500	24,000 22,400 25,500	12,000 22,400 25,600	
LABOR FOR SURFACE SAMPLES AIR QUALITY MONITORING FIELD BLANKS GROUNDWATER SURFACE MATER SEDIMENT	1 1 1 2 1 1	LS LS EA EA	700 700 1400 1460	1,400 1,400 11,200 2,800 3,200	1,400 1,400 4,400 2,800 3,200	
DUPLICATES GROUNDWATER SUIGFACE WATER SEDIMENT SHIPPING CHARGES		EA EA EA EA	1400 1400 1600	11,200 2,800 3,200	2,800 3,200	\$\$1100/WELL AFTER 1 YEAR :\$1100/WELL AFTER 1 YEAR
2. SAMPLING DURING EXCAVATION (\$/YEAR)	İ					
LABOR FOR SOIL SAMPLING LABORATORY TECHNICIAN		LS				11 TECH. FULL TIME, FIRST 5 YEARS 12 TECH'S FULL TIME, FIRST 5 YEARS
3. INSPECTION (\$/YEAR)						٤
SITE INSPECTION	1	LS	1800	3,600		1 E1, 1 TECH, 3 DAYS, TWICE PER YEAR
4. OTHER HAINTENANCE (\$/YEAR)						
REFURBISH WELL SCREENS MONITORING WELLS CAP REPAIRS (ANNUAL) ENDOLUM CONTROL	1	L\$				CLEAN EVERY 10 YRS. 2 WEEKS LABOR, 2 PEOPLE
EROSION CONTROL FREEZE/THAN REPAIRS MONING FENCE MAINTENANCE	: 85 : 85	AC AC AC LS	225 670	19,125 56,950	;	
CAP REPAIRS (\$/REPAIR) FINE SURFACE GRADING	1 : 280720	: :		·		EVERY 10 YEARS

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COMBINED ALTERNATIVE ANALYSIS - ALTERNATIVE 9: ACCESS RESTRICTIONS WITH RORA LANDFILL

PRESENT WORTH (BASED ON ANNUAL CAPITAL COST) ANALYSIS

YEAR	ANNUAL CAPITAL COST \$	ANNUAL OLM COST \$	DISCOUNT RATE	PRESENT WORTH			
0 1 2 3 4 5	\$104,B24,000	\$564,000 \$335,000 \$335,000 \$335,000	0.90909 0.82645 0.75131 0.68301	\$104,824,000 \$512,727 \$276,861 \$251,689 \$228,808	ANNUAL COSTS HONITORING (#/SAMPLING ROUND)	FIRST YEAR	AFTER : FIRST : YEAR :
8 9 10		\$335,000 \$335,000 \$220,000 \$220,000 \$220,000 \$220,000 \$504,720 \$220,000	0.68301 0.62092 0.56447 0.51316 0.46651 0.4241 0.38554	\$208,008 \$124,183 \$112,895 \$102,632 \$97,302 \$195,361	MONITORING WELLS LABOR - MONITORING WELLS SURFACE WATEK SEDIMENT LABOR - SURFACE SAMPLES	229,500 24,600 22,400 25,600 1,200 1,400	30,800 12,000 22,400 25,500 1,200
11 12 13 14 15		\$220,000 \$220,000 \$220,000 \$220,000 \$220,000 \$220,000	0.35049 0.31863 0.28966 0.26333 0.23739 0.21763	\$77,108 \$70,099 \$63,725 \$57,933 \$52,666 \$47,979	AIR DUALITY MONITORING FIELD BLANKS GROUNDWATER SUMFACE MATER SEDIMENT DUPLICATES	1,400 11,200 2,800 3,200	1,400 4,400 2,800 3,200
17 18		\$220,000 \$220,000 \$220,000 \$506,) \$220,000 \$220,000	0.19784 0.17986 0.16351 0.14864 0.13513 0.12285	\$47,879 \$43,525 \$39,569 \$35,972 \$75,319 \$29,729	GROUMDHATER SURFACE WATER SEDIMENT SHIPPING CHARGES	11,200 2,800 3,200 8,000	4,400 2,900 3,200 4,000
19 20 21 22 23 24 25 26 27 28		\$220,000 \$220,000 \$220,000 \$220,000 \$220,000	0.11168 0.10153 0.0923 0.08391 0.07628	\$27,027 \$24,570 \$22,337 \$20,306 \$18,460 \$16,782 \$15,255	EXCAV. SAMPLING (IST 5 YRS) \$/YR (GUARTERLY - 1ST YEAR) \$/YR (SEMI-ANNUALLY YEARS 2 THRU 5) \$/YR (SEMI-ANNUALLY AFTER 5 YEARS)	115,200 \$451,000 \$233,900 \$118,000	
29 30	\$6,527,000	\$220,600 \$220,000 \$504,729	0.06934 0.06304 0.05731	\$13,869 \$403,102	ANNUAL COSTS (SAME EVERY YEAR, \$/YR)		
TOTAL O	AN PRESENT WORTH			\$2,888,000	. INSPECTIÓN : GEN. MAINTENANCE	3,600	
TOTAL REPLACEMENT PRESENT WORTH TOTAL PRESENT WORTH			\$374,000 \$108,086,000	CAP MAINTENANCE FENCE MAINTENANCE MOWING	38,250 3,600 56,9 5 0		
					TOTAL ANNUAL COSTS (\$/YEAR)	\$102,000	; ;
					NONANNUAL MAINTENANCE (\$/ACTIVITY)		
					RCRA CAP EAF REPAIRS (EVERY 10 YEARS)	\$280,720	
					MONITORING SYSTEM REFURBISH SCREEMS (EVERY 16 YEARS)	\$8,000	;

Appendix B
DISTRIBUTION OF ALTERNATIVE COSTS
BETWEEN ECC AND NSL

Appendix B DISTRIBUTION OF ALTERNATIVE COSTS BETWEEN ECC AND NSL

Distribution of CAA Alternative costs between ECC and NSL was included for purposes of cost recovery. During negotiations with potential responsible parties (PRP's) or during possible court action, EPA will need to assign remedial action costs to ECC PRP's and to NSL PRP's. The cost breakdowns presented here are believed to be based on a reasonable methodology, given the existing data and understanding of the site. Distribution of costs for the selected remedial action should be re-evaluated following final design since additional data on the site and more accurate cost estimates will be available at that time.

The methodology for distribution of costs of the CAA alternatives between ECC and NSL are discussed below for each alternative. Where components appear in more than one alternative, the cost breakdown is discussed only for the first alternative in which it appears. Cost items referred to in this appendix are presented in the detailed cost tables of Appendix A.

Costs were distributed to the two sites based on the physical dimensions of the sites. Costs of components remediating groundwater contamination in the southwestern corner of the site, where the contaminant source could be either ECC or NSL, were divided equally between the sites.

Contingency estimates are applied at the same percentage used for the CAA alternative unless noted otherwise. Services during construction and engineering design costs are distributed based on the site's proportion of the CAA construction total, unless noted otherwise.

ALTERNATIVE 2

1. STABILIZE LAND SURFACE

Preliminary Grading on NSL. Grading is limited to NSL. 100 percent of cost assigned to NSL.

Runoff Control. Construction of new ditches is entirely on NSL. 100 percent of cost assigned to NSL.

Soil and Vegetative Cover. Area of cover includes ECC and NSL. Distribute cost based on area of sites. ECC area equals 3.6 acres. NSL area equals 70 acres. Assign 5 percent of cost to ECC and 95 percent to NSL.

Access Roads. Access road improvements limited to NSL. 100 percent of cost assigned to NSL.

2. REMOVE CREEK AND LEACHATE SEDIMENT

All sediment removed is upgradient of ECC and, therefore, is attributable to NSL. 100 percent of cost assigned to NSL.

3. REROUTE FINLEY CREEK AND UNNAMED DITCH

Cost of relocating unnamed ditch from between the sites is split equally between ECC and NSL. Also, relocation of 600-foot section of Finley Creek south of ECC is split equally between the sites. The remaining 1,600 feet is assigned to NSL. This results in 26 percent of cost assigned to ECC and 74 percent to NSL.

4. MONITORING PROGRAM

Capital Costs. Installation costs of four monitoring wells assigned to ECC (two wells onsite and two wells immediately west of the site). Costs of five wells south of ECC split equally with NSL. The remaining 17 wells and 4 piezometers are assigned to NSL. Results in 12 percent of cost assigned to ECC and 88 percent to NSL.

Operation and Maintenance. Sampling and analysis costs for five monitoring wells assigned to ECC. Sampling and analysis cost of five wells south of ECC split equally between ECC and NSL. Costs associated with the remaining 31 wells assigned to NSL. Eighteen percent of groundwater monitoring cost assigned to ECC and 82 percent to NSL.

Sampling and analysis costs of six surface water and sediment locations split equally between ECC and NSL. Costs of two remaining locations assigned to NSL. This results in 38 percent of costs assigned to ECC and 62 percent to NSL.

Air monitoring costs split equally between ECC and NSL.

These breakdowns result in 24 percent of the monitoring program operation and maintenance cost assigned to ECC and 76 percent to NSL.

5. LEACHATE COLLECTION SYSTEM

Leachate collection system is attributable solely to NSL.

6. LEACHATE TREATMENT

Leachate treatment is attributable solely to NSL.

7. ACCESS RESTRICTIONS

Costs distributed based on linear feet of fence. Length of fence on north, west, and south boundary of ECC is 1,300 feet. Total fence length is 9,300 feet. Assign ECC 14 percent of cost and NSL 86 percent.

CONTINGENCIES AND INDIRECT COSTS

Distributed as per general methodology discussed earlier.

ALTERNATIVE 3

(See Alternative 2 for duplicate components)

3. ECC SITE WORK

ECC site work is attributable solely to ECC.

5. RCRA CAP CONSTRUCTION

Preliminary Grading. Preliminary grading on NSL only. Cost is 100 percent attributable to NSL.

Cap Construction. Cost of gas collection layer is 100 percent attributable to NSL, because it is not needed at ECC. Remainder of cap construction cost is distributed based on cap area. ECC assigned 5 percent of remaining cost and NSL 95 percent, per respective site areas (see Alternative 2; 1. Stabilize Land Surface).

<u>Vegetative Cover.</u> ECC assigned 5 percent of cost and NSL 95 percent.

ALTERNATIVE 4

(See Alternatives 2 and 3 for duplicate components)

MONITORING PROGRAM

Capital Costs. See Alternative 2.

Operation and Maintenance Costs. Sampling and analysis costs of groundwater monitoring the same as Alternative 2 for year 1. Costs for years 2 through 30 assigned as follows: one well assigned to ECC (west of site) and five wells (four wells south of site and one background well) split equally between sites. Remaining eight wells assigned to NSL. This results in 25 percent of groundwater monitoring costs assigned to ECC and 75 percent to NSL for years 2 through 30. Surface water, sediment and air monitoring costs assigned

as in Alternative 2. Resulting operation and maintenance costs of overall monitoring program result in ECC with 31 percent of cost and NSL 69 percent.

6. GROUNDWATER INTERCEPTION

Costs associated with two of the six extraction wells assigned to ECC (located near southwest corner of ECC). Costs of next two wells south of ECC split equally between the sites. Remaining two wells assigned to NSL. French drain interception south of NSL assigned to NSL. This results in 10 percent of costs of ground-water interception assigned to ECC and 90 percent to NSL.

8. GROUNDWATER COLLECTION - ECC

All costs assigned to ECC.

9. GROUNDWATER/LEACHATE TREATMENT

Several methodologies were considered for distribution of treatment costs.

Methodologies involving assigning cost based on treatment flowrate or contaminant loading rates were considered but rejected for the following reasons:

- A portion of contaminated groundwater from NSL may migrate beneath ECC and pick up additional contaminants, making it difficult to assign contaminant loading rates to one site or the other.
- o Contaminated groundwater in the southwest portion of the site may be from either site. Assigning contaminant loading or flowrates between the sites is difficult in this area.
- o Treatment of ECC groundwater was considered necessary for organics removal only in the ECC FS Report, while NSL groundwater requires metals and organics removal. Assignment of all metals removal costs to NSL would be appropriate. However, since the ECC groundwater becomes comingled with NSL contaminated groundwater prior to entering the collection system, treatment for metals removal is necessary for flow from both sites. Technical justification for assignment of this additional cost to ECC or NSL is not clear.
- o Capital and operation and maintenance costs for removal of organics is higher on a per gallon basis for the PACT system versus the GAC system

considered appropriate for ECC groundwater in the ECC FS Report. Using the unit cost of organics removal for the PACT system for removal of organics originating from ECC would result in an excessive cost assigned to ECC.

Because of these considerations it was decided a more simplistic but reasonably equitable distribution of costs was justifiable. This method involves assigning costs of the CAA treatment system in the same proportion as the costs of treatment systems considered appropriate in the respective ECC and NSL FS's.

Capital Costs. The capital cost of groundwater treatment for ECC FS Alternative 4 is \$157,000. The capital cost of groundwater and leachate treatment of NSL Alternative 4 is \$1,803,000. The ECC cost is 8 percent of the summed costs of treatment and NSL is 92 percent. These percents are then applied to the CAA treatment system costs.

Operation and Maintenance. The annual average operation and maintenance cost of groundwater treatment for ECC FS Alternative 4 is \$78,000. The cost of NSL Alternative 4 treatment is \$658,000. The ECC operation and maintenance cost is 11 percent of the summed total and NSL is 89 percent.

ALTERNATIVE 5

(See Alternatives 2, 3, and 4 for duplicate components)

5. RCRA CAP CONSTRUCTION

Cap Construction. Cost of gas collection layer is 100 percent attributable to NSL. Remainder of cap construction cost is distributed based on cap area as in Alternative 3. Cost of additional 3 acres of cap to the south of ECC in Alternative 5 is split equally between ECC and NSL. This results in 7 percent of total cap cost assigned to ECC and 93 percent to NSL.

6. GROUNDWATER INTERCEPTION

Costs associated with 300 feet of intercepting drain assigned to ECC (Section nearest ECC). Cost of next 300 feet split equally with NSL. Remaining 2,500 feet south of NSL assigned to NSL. This results in 15 percent (450 feet/3,100 feet) of cost assigned to ECC and 85 percent to NSL.

8. GROUNDWATER/LEACHATE TREATMENT

Capital and operation and maintenance costs distributed as in Alternative 4. Capital cost distributed

8 percent to ECC and 92 percent to NSL. Operation and maintenance cost distributed 11 percent to ECC and 89 percent to NSL.

ALTERNATIVE 6

(See previous alternatives for duplicate components)

6. GROUNDWATER ISOLATION

Cost of French drains divided between sites based on length of drain. One thousand feet of drain to the north and west of ECC assigned to ECC. Seven hundred feet of drain south of ECC split equally between the sites. This results in 25 percent of the cost of drains assigned to ECC and 75 percent to NSL. Cost of extraction wells assigned solely to NSL. As a percent of total groundwater isolation costs, ECC was assigned 16 percent and NSL 84 percent.

9. GROUNDWATER/LEACHATE TREATMENT

Capital and operation and maintenance costs distributed as in Alternative 4. Capital cost distributed 8 percent to ECC and 92 percent to NSL. Operation and maintenance cost distributed 11 percent to ECC and 89 percent to NSL.

ALTERNATIVE 7

(See previous alternatives for duplicate components)

10. SOIL VAPOR EXTRACTION

Soil vapor extraction of ECC soils only. All costs assigned to ECC.

ALTERNATIVE 8

(See previous alternatives for duplicate components)

10. SOIL INCINERATION

Soil incineration of ECC soils only. All costs assigned to ECC.

ALTERNATIVE 9

(See previous alternatives for duplicate components)

4. RCRA LANDFILL

Cost of RCRA landfill divided based on excavated volume of contaminated soil or landfill contents. Volume of ECC-contaminated soil is 150,000 cubic yards. Total ECC and NSL volume is 4,400,000 cubic yards. ECC allocated 3 percent of total cost (150,000 cy/4,400,000 cy) and NSL 97 percent.

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Appendix C GROUNDWATER COLLECTION SYSTEM ANALYSIS

INTRODUCTION

Detailed analyses of the groundwater system at the site are presented in the ECC FS (Appendix B: Groundwater Collection System Configuration Calculations) and the NSL FS (Appendix B: Groundwater Analysis). Estimates of flows for the combined alternatives were modified from the estimates in the ECC and NSL Feasibility Study reports.

ALTERNATIVE 2

The flow for Alternative 2 will be due to percolation through the landfill surface which will result in the generation of leachate. The leachate collection system for this or any of the combined alternatives does not extend around the ECC site. Therefore, the rate of leachate generation for this alternative will be the same as for NSL Alternative 2, or 40 gpm.

ALTERNATIVE 3

The flow for Alternative 3 will be due to drainage of leachate from the landfill for the first 5 years as the RCRA cap is constructed, and to percolation through the RCRA cap after 5 years. The flows will be the same as for NSL Alternative 3: 40 gpm for the first 5 years and 5 gpm after that.

ALTERNATIVE 4

The flow for Alternative 4 has three components:

- o Leachate generation through the landfill surface
- o Flow to a groundwater collection system along the south and southwest boundaries of the site
- o Flow to closely spaced French drains in the till unit above the sand and gravel lens at the ECC site.

The rate of leachate generation will be the same as for Alternative 2, or 40 gpm. The groundwater collection system will be similar to that for NSL Alternative 4. The configuration of the French drain along the south boundary of the site will be the same as for NSL Alternative 4, and therefore the flow to the drain will be the same (23 gpm). Groundwater extraction from the sand and gravel lens at the southwest portion of the site can be accomplished using the six wells pumping at 11 gpm each included in NSL Alternative 4, except that the wells would be located southwest of the ECC site to intercept groundwater before it discharges to Finley Creek. The flowrate from the wells would be the same as for

NSL Alternative 4, or 66 gpm. A rate of 8 gpm was estimated in the ECC FS for flow to the closely spaced French drains.

The resulting total flow for Alternative 4 is approximately 140 gpm, which consists of 40 gpm from leachate generation, 90 gpm from the groundwater collection system, and 8 gpm from the French drains at the ECC site.

ALTERNATIVE 5

The flows for Alternative 5 have two components:

- o Leachate generation through the landfill surface
- o Flow to a groundwater collection system along the south and southwest boundaries of the site.

The rates of leachate generation will be the same as for Alternative 3: 40 gpm for the first 5 years as a RCRA cap is placed on the landfill surface and leachate drains from the landfill, and 5 gpm after the first 5 years.

The groundwater collection system will be similar to that in Alternative 4 with one exception. A subsurface drain will be used in the sand and gravel lens in the southwest portion of the site instead of extraction wells, and the south side of the drain will be lined with an impermeable barrier to minimize flow to the drain from Finley Creek. It is estimated that the flow to the drain without the barrier would be the same as to the extraction wells (66 gpm), but that placement of the barrier will cut the flow in half (to 33 gpm). Therefore, flow to the groundwater collection system in Alternative 5 would be approximately 60 gpm instead of the 90 gpm in Alternative 4.

The resulting flows for Alternative 5 will be 100 gpm for the first 5 years (40 gpm for leachate generation and 60 gpm from the groundwater collection system), and 65 gpm after 5 years (5 gpm from leachate generation and 60 gpm from the groundwater collection system).

ALTERNATIVE 6

The flows for Alternative 6 have three components:

- o Leachate generation through the landfill surface
- o Flow to a groundwater collection system around the periphery of the site
- o Flow to closely spaced French drains in the till unit above the sand and gravel lens at the ECC site.

The rates of leachate generation will be the same as for Alternative 3: 40 gpm for the first 5 years as a RCRA cap is placed on the landfill surface and leachate drains from the landfill, and 5 gpm after the first 5 years.

The flow to the closely spaced French drains at the ECC site will be due to percolation through the RCRA cap. If it is assumed that percolation will occur at a rate of 1 in/yr $(0.0000012 \text{ gpm/ft}^2)$ through a cap with an area of 6.5 Ac $(283, 140 \text{ ft}^2)$, then the percolation rate, Q, can be estimated as:

 $Q = (0.0000012 \text{ gpm/ft}^2) (283, 140 \text{ ft}^2)$ = 0.34 gpm

A value of 0.5 gpm was used for flow to the ECC French drains.

The flow to the groundwater collection system in Alternative 6 will be similar to that in NSL Alternative 6, except that the length of the French drain encircling the site will be approximately 450 feet longer so that the drain may extend around the ECC site. The drain extension will occur in materials that are hydrogeologically similar to those in drain segment 6 of NSL Alternative 6.

Drain segment 6 is approximately 1,000 feet long and has an estimated total flow of 67 gpm, or 0.067 gpm/ft. If the segment is extended 450 feet, then the increase in flow, dQ, over that estimated for NSL Alternative 6 will be:

dQ = (450 ft)(0.067 gpm/ft) = 30 gpm

Therefore, the flow to the groundwater collection system in Alternative 6 will be 30 gpm greater than that estimated for NSL Alternative 6, or approximately 200 gpm. The flowrate to the groundwater collection system while the water table beneath the site is being lowered will be the same as for NSL Alternative 6, or approximately 100 gpm.

The resulting flows for Alternative 6 will be 340.5 gpm for the first 5 years (40 gpm from leachate generation, 0.5 gpm from the ECC French drains, 100 gpm from the lowering of the water table beneath the site, and 200 gpm from the ground-water collection system), and 205.5 gpm after 5 years (5 gpm from leachate generation, 0.5 gpm from the ECC French drains, and 200 gpm from the groundwater collection system).

ALTERNATIVES 7 AND 8

Flows for Alternatives 7 and 8 will be the same as for Alternative 6.

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